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THE arbitration tribunal appointed under the Wallace act to decide the questions at issue between the operators and the miners in the railroad pits of the Pittsburg District is making very slow progress. Committees have been appointed to look into the condition both of the lake trade and of the local trade, and have reported after considerable delay. The facts, whatever they may have been, do not appear to have carried conviction to the minds of either party as to the fallacy of their position ; and after a number of fruitless meetings, the umpire, Mr. JOHN R. MCCUNE, President of the Union National Bank of Pittsburg, has been called upon to decide the question of wages. It will be remembered that the pits are now working under a temporary arrangement, pending the decision, and that, according to the Wallace act, it is not binding on either party so far as questions of wages are concerned. Whatever may be the ruling of the umpire, it is to be hoped that it will be accepted in good faith, and that no complications will arise from a refusal of either party to abide by it.

THE rapid improvement in the methods of manufacturing steel, notably in the open-hearth, and the growing quantity produced in this country, are beginning to tell on the old established iron manufacture. At the present day, quality for quality, steel for many structural and merchant purposes is cheaper than iron, and after some hesitation, always experienced in the introduction of any thing that is new, consumers are taking hold vigorously. The competition is most keenly felt by the makers of special brands of wrought-iron, and has had the effect to a notable extent to lower the quality of the wrought-iron. In their efforts to meet a steadily declining market, makers of special brands have been found to relax in the choice of their raw materials, and to save as much as possible in manipulation. Quality, of course, has suffered under such a system, the temptation to avoid losses and to hold ground so long absolutely under their sway being too great, in many cases, especially as many consumers have unbounded confidence, and do not stop to investigate. We do not believe that such a system can long be continued with impunity.

DURING the past few years, large consumers of rolled iron and steel have begun more and more generally to devote their attention toward providing facilities for themselves manufacturing the cruder forms of iron and steel. The growth in the demand for all kinds of railroad and agricultural machinery has developed manufacturing establishments of great magnitude in the Eastern and Western States. Beginning with ordering special shapes of cast or rolled metal in small quantities, they have grown as consumers, until, to-day, when reasonably busy, they call for very large quantities of material. They have now begun to invest surplus capital in the building of plant for the manufacturing of their own special shapes from cruder material, which they have no trouble in getting in the open market. Their avowed purpose in putting up rolling-mills and foundries of their own is not so much themselves to pocket the profit which those made from whom they bought. They are actuated chiefly by other considerations, the principal being that, having sole control of the preliminary stages of manufacture, they can better make just what they want, are in a better condition to adapt themselves more promptly to changes in their requirements, and can avoid delays and annoyances incident to their dealings with parties whose interests are not always in harmony with their own. It gives them, they claim, a fuller and more absolute control over the quality of their raw material, and hence allows them to place their finished goods in the hands of their customers with more confidence. Of course, only the very largest concerns are in a position to follow such a policy, as it is possible only when the quantities required in the course of manufacture are such as to give regular employment to a special plant. There are indications that this movement will go even farther, and lead to the building of open-hearth furnaces, etc. The advantages which it offers are undoubtedly great, without reference to any saving in the cost, which we believe is entirely problematical. Comparatively, such works must always be restricted in character, and can not command raw material and facilities as cheaply, nor can they gather and hold permanently a large force of skilled workmen, foremen, and engineers.

CORRESPONDENCE.

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The Future of Pyrites Mining on the Eastern Sea-Board.

EDITOR ENGINEERING AND MINING JOURNAL :

SIR : Of the manufacturers or those most interested in the question of cheap sulphuric acid in the United States, comparatively few have as yet studied closely or realize fully the importance of the problem now working out by the miners or producers of pyrites.

In an article published by you nearly three years ago, I gave some figures to prove the value of pyrites in comparison with brimstone. It is well known that prices of brimstone in cargo lots have varied but little during that period, yet the wholesale price of commercial acid has changed about 100 per cent. So radical a drop in selling rates can not be accounted for by the lessening of expenses or increased production from like quantities of crude materials : but a reason can perhaps be found in the erection of surplus chambers to supply the active trade of the years 1881-82 ; and such increase in capacity could only result in a check later on, when the supply was greater than the demand. In seasons of depression, the small firms lower prices, in order to retain trade ; but, unlike former struggles of this kind, the markets are held in the firm grasp of a new class of producers, who claim to be able to make full profits even at this reduced price. These new parties are becoming prominent leaders, from the fact of their ready acquiescence in the manifest destiny of sulphuric acid manufacture from pyrites ores mined in this country. Three years ago, but one or two firms were using pyrites in small quantities, whereas, at the present writing, ores are burned as follows :

Bergenport, N. J., about	60 tons.	New Bedford, Mass.	5 tons.
Newtown Creek, N. Y., about.	65 "	Boston and vicinity, Mass.	20 "
Bridgeport, Conn.	10 "	Elsewhere	10 "
Elizabeth, N. J.	30 "	Total daily consumption	200 tons

There is, of course, a reason for the very slow growth of an industry promising such margins of profit ; but whatever the cause in the past, the fact must now be recognized that acid can not be made from brimstone and sold at present prices ; and further, that manufacturers must meet

future trade on about the same basis, to do which pyrites alone can be used.

The difference in cost of sulphur from both sources will make this statement more forcible, namely :

Brimstone (98 per cent sulphur) is selling for	$28.00
Pyrites, 2 tons (4480 pounds) cost delivered in New York, say 13 cents per unit of sulphur, or 4480 pounds pyrites (48 per cent sulphur) @ $6.25	= 12.50
In favor of pyrites	$15.50

Produce :

2 tons pyrites, 4480 pounds (48 per cent sulphur)	= 2150 pounds sulphur	
Waste, cinders, etc., 5 per cent	108 pounds	2042 pounds net.
1 ton brimstone (98 per cent)	= 1960 pounds sulphur	
Waste, ash, etc., 2 per cent	39 pounds	1921 "
Balance of sulphur in favor of pyrites	121	" "

Nearly enough to cover difference in cost of working pyrites.

It is easy to see why the present consumers of ores can run their plant to fullest capacity while brimstone-burners are complaining of dull times and slow sales ; and the sooner the trade settles down to these facts, the better for it.

The principal demand for surplus low-grade acids (the making of which justifies large acid plant) has been and will continue to be, for manufacture of superphosphates, the bulk of which is sold south of Baltimore. So wide has been the price of acid made from brimstone here and from pyrites abroad that, annually, tens of thousands of tons of rock phosphate have been sent to Europe for treatment, and then returned to us for use on our exhausted soils. The freight alone on this double shipment is all the profit our agricultural people should be made to pay ; and the strange fact remains that, midway between the sections of greatest production in acids and greatest consumption in superphosphates, there are deposits of the choicest pyrites ever found in quantities, so pure as to rival brimstone in acid-making properties, yet utilized to a very limited extent.

It would be safe to say that ores from these deposits in Virginia can be laid down in every city from New York southward at prices which will guarantee commercial acid (66° B.) at one cent per pound from this time on, and this reduction should affect the price of superphosphates at least thirty per cent from established rates. Assuming that 250,000 tons of fertilizers are consumed annually, costing to average forty dollars per ton, this saving, which should go to farmers, would be so enormous as to double the consumption in a short time, and as a result larger chamber capacity would be required than now used. The increase naturally would be placed nearer to consumers, thus shifting the balance of trade southward. The outlook for the acid trade is certainly encouraging ; but pyrites must from henceforth be the material for its manufacture. What has heretofore been a side issue in our mining industries will now come to the front in such grand proportions as to astonish people unacquainted with the productions of European mines.

Should the manufacturers combine, becoming owners of the pyrites deposits, as is the case with the Rio Tinto and Tharsis mines, there will be seen in this country products exceeding those famous properties, and that within a few years. The fertilizer trade of the South would alone warrant such development, outside of the increasing demands of our country generally. So rapidly is the public becoming awakened to a realization of this new but permanent industry in mining that the change will be upon us before we are aware, and a mineral product will be added to the natural wealth of the Eastern slope, rivaling the mine products of the West. Even Europe can be supplied with pyrites at less rates than paid for Spanish ores ; and with the large working of such deposits along our sea-board, a new impetus will be given to trade channels into which sulphuric acid enters.

Connected with this commencement of operations, will be found the usual crop of "prospects" offered by irresponsible parties, and would-be purchasers should remember that over all the world's surface there are but very few paying deposits yet opened ; and from the peculiar nature of the ores, there can not be found any great number of mines, with quality of mineral, and proper location for shipment.

There are so many drawbacks connected with the securing of these attributes that more than careful examinations should be made of all details, to avoid the inevitable loss that attends mining ventures carelessly entered into.

The problem of placing our Eastern sea-board in the lead for pyrites mining will be, however, the work of but a short time, with the activity usually displayed in our enterprises, and to careful men with large capital the promised reward is beyond precedent. W. H. A.

Dredging for Gold.

EDITOR ENGINEERING AND MINING JOURNAL :

SIR : I have been favored with a copy of a prospectus issued by a company which proposes the use of a new dredging system for working auriferous river sands. As regards the apparatus itself, it may be briefly described as a suction-pump actuated by a vacuum produced in a large vessel supplied with steam from a small boiler. The sandy silt, etc., from the river bottom are intermittently raised through a draught-pipe into the vacuum-chamber, and are thence discharged into a sluice-box supported upon the scow which carries the dredging apparatus. As a means of dredging, pure and simple, there is no reason why this system should not work ; and I believe that experiments have shown that it is capable of handling considerable quantities of material. How the results compare with those of the ordinary dredging-machines, I can not say.

But the main object of this invention is apparently the recovery of gold from Southern river-beds. I quote from the circular of the company :

"From the time of the discovery of gold in California to the present day, mining in this country has developed into such gigantic proportions that it seems to have already outstripped the most visionary expectations of the early Spaniards, and the methods of mining, in their variety, immensity, and ingenuity, have followed closely in its wake, and have only been equaled by the circumstances calling them forth. Of the gold produced, it is estimated that 75 per cent has been obtained from river-beds and gravel-banks, and the means used to save the gold contained in this sand or gravel have varied from the primitive mining-pan of early days to the most elaborate system of sluices, riffles, blankets, and the amalgamated copper and silver plates of to-day. A great many streams admitted to be rich in gold-bearing deposits are abandoned because of the outlay necessary to dam them and make their beds accessible, and the fact that heavy rains and melting snows so frequently produce freshets that sweep away all that presents any obstacle to their headlong course. To obviate these difficulties, and make 'river mining' a practical and comparatively inexpensive enterprise," etc.

Schemes of this kind are an old story on the Pacific coast, having been tried in almost every possible variety during the early period of wild experimentation. Dredgers of different kinds, driven by steam and otherwise, were tested in the Sacramento, San Joaquin, Feather, and American rivers and their tributaries, in every case proving absolute failures. At the time of the excitement about the supposed bonanza at Gold Bluffs, on the sea-coast, a steam dredger was made and sent up from San Francisco to this locality, with the view of working the ocean sands.

Now it is a remarkable fact that, in almost every case where the dredging-machine was tried, the actual presence of gold was a fully determined fact ; and in some instances, dredging failed in places where other methods working side by side were successful. The whole matter was given a full and fair trial in California, and the plan has been emphatically condemned. As a Californian, I can say that the man who should attempt to revive the system of dredging for gold in our State would simply be regarded as being deficient in experience ; and any attempt to raise money for a further trial would be met with derision. In California, the principles of mining for the precious metals and for extracting them are now clearly understood, and resolve themselves into a few simple but hard facts. It is in the Southern States, where gold mining has been practiced on a small scale since the beginning of the century, and where presumably the people ought to know something about it by this time, that most of the visionary and exploded schemes are tried ; the only other field being in mines of the far West managed by people who have no practical knowledge of the subject. (I refer to the class popularly known as the "tender-foot.")

The principal reason why dredging for auriferous sands is not a profitable occupation lies in the nature of the occurrence of gold in river-bottoms. The river-bed acts as a sort of natural ground-sluice, and collects the gold in positions which are not accessible to a dredging apparatus. The misconception upon which similar schemes are founded is, that gold is disseminated regularly through the sand and silt of the river-bottom, so that the question is simply one of raising these materials above the surface. As a matter of fact, the gold particles betake themselves, with characteristic cunning, to all the crevices and out-of-the-way places in which they can hide. Hence, if the bed-rock of a gold placer consists of soft decomposed rock, or of slates, or of schists tilted at a high angle, gold is found permeating it to a considerable distance. In cleaning up the bed of every creek from which the water has been diverted, the gold, even if very finely disseminated, is found in pockets or crevices. An experienced miner at a glance detects the likely spots, and works accordingly. Now if the dredging-machine, instead of lifting all the light, loose, and comparatively barren *detritus* of a river, could get at the right places, and coax the gold from its retirement, the scheme would be a very pretty one. I am supposing that the Southern river-beds, particularly some of those in Georgia, really do contain workable quantities of gold. So much exaggeration always accompanies reports from this region that one needs to heavily discount any statement as to the tenor of these sands. It is a very simple proposition, and one which has been thoroughly established in practice, that if the river-bed is poor, it will not pay to work by any method ; and if it is rich enough to pay for damming, fluming, etc., there is no mystery about the means of working.

I recently read a very glowing account of some Georgia mines in one of the daily papers. The enthusiastic correspondent by whom this was written, among other statements, said that the Georgia gold-fields are "the richest in the United States ;" a remark which seems a little "off," in view of the fact that fifteen States and territories outrank Georgia in point of annual production, and that Georgia furnishes less than one per cent of the total annual gold product of the country. Another statement made by this correspondent was, that English capitalists had paid 5,000,000 for a tract of land in Georgia "guaranteed to contain a gold mine." Still another was, that the ores of this particular locality are "the richest known, but so impregnated with sulphur as to be impracticable for mining." This latter difficulty, however, it is proposed to obviate by a process of which the only description is contained in the following words, which I quote : "By means of electricity and silver cloths, of desulphurizing gold ores to a fine assay."

This, of course, is simply idiotic. There is, on the other hand, nothing apparently absurd about the plan of dredging for gold ; indeed, at one time it occupied the attention of many practical and intelligent miners. It is always a most promising method to those who are ignorant of its history. There is only one difficulty connected with it—it has never been known to pay in the past ; it does not pay now ; and the chances are, that it never will pay. A. W.

NEW YORK, June 11.

THE CRUSHER CONTEST.—On the 30th of May, a public trial was had at Meriden, Conn., between the Gates and the Marsden-Blake crusher. The committee having charge of the contest was composed as follows : W. W. Wright, of the Bradley & Hubbard manufactory, Meriden ; P. Callanan, a contractor of South Bethlehem, N. Y. ; J. S. Lane, road-master of the Hartford division of the New York, New Haven & Hartford Railroad ; Simon Ingersoll, President of the Ingersoll Manufacturing Company, Stamford, Conn. ; Isaac Skidgell, official boiler inspector of Meriden. After the contest, the committee met and signed the following report, dated Meriden, Conn., May 30th, 1883 : The committee met at the quarry of the Messrs. Carpenter Brothers on the above date, to investigate the merits of a 9 by 14 Gates ore-crusher, and a Blake crusher with Marsden's improvements, 9 by 15. The Gates crusher was first run with the following result : Amount of stone crushed, 9 yards ; time used in crushing, 20½ minutes. The Blake crusher was then run with the following result : Amount of stone crushed, 9 yards ; time used in crushing, 6½ minutes. The crushers received and discharged the same sized stone, and same kind of stone. The machines were run from the same shaft.

IRON ORE.

Special Correspondence of the Engineering and Mining Journal.

When a telegram came up from Cleveland, on the first of this month, saying that the iron-masters had signed Mr. Jarrett's scale, and that the strike had miscarried, we lake people had a little celebration in a quiet way. Many of our merchants had laid in stocks during the good times of last year, which it would certainly require good times this year to work off, if Bradstreet's agency and the appearance of several of the assessors' rolls signify any thing; and more than one of these saw in a continued strike the infallible portents of bankruptcy. The revival of general business which has set in since the first of June has given buoyancy to all departments of lake industry, and the probabilities are, that the freer circulation of money which has now set in will prevent the phantoms of wholesale and other creditors from materializing in these parts. The mines are now shipping with some energy, although in not so great volume as last season, when the totals sent from Escanaba, St. Ignace, L'Anse, and Marquette had reached by the first week in June 486,101 tons, as contrasted with 269,604 tons for a like period this year. One reason for this discrepancy is the late opening of navigation; but the more adequate reason is the condition of the iron trade. What tactics the mines will pursue as summer comes on, as yet remains to be seen, the future of our shipping depending largely upon sales from now on. One of the largest producing mines will send down cargoes of hard and soft ores until its contracts with vessel-owners have expired, when it will begin a process of restriction. All in all, however, it is probable that the volume will be in increasing and not decreasing ratio, at least until fall.

But a small fraction of the ore which has been consigned to lower ports is as yet sold, and little if any of it is needed by any of the furnaces. In the case of the Republic, however, it was not to be expected that its product would be held at the mine stock-piles, since its fleet of schooners would thereby remain idle or seek business in wild-cat charters. It may seem strange, in view of the comatose condition of the ore trade, that so large a body of ore is sent below, where it must necessarily be much more available to the tender mercies of a glutted market and furnacemen, who, having failed in their battle with the Amalgamated Association of Iron-Workers, are quite likely to transfer the struggle to a less strategically defended field. Even if it should transpire that Eastern puddlers had been guilty of treachery during the debates with Mr. Jarrett, it will not hinder the mills from making common cause against the producers of ore. It was the manifest intention of the iron-masters to make their skilled workmen and the miners share alike in bearing the burdens of the general depression; but as matters now stand, to pinch the mines is their only resource. It was the hight of foolery for certain metropolitan papers to assert that the workingmen were asked to bear the whole burden of hard times, and the arithmetic by which this "answer" was obtained was as novel as it was stupid. Ruling quotations for standard ores would have knocked such columns of nonsense into "pi." To what comparative extent it was really the intention of the mill-owners to make their workmen and the mines bear the financial strain of the present prices for manufactured products, does not, of course, appear, since there are as yet positively no quotations of ores at all which can be given as standard or the basis of calculations; but it may be safely relied upon that, if the schemes of the mill-owners had not miscarried, it is far from likely that the year would have been unremunerative to them, even on a small volume of business. This much, however, is certain, the mines must prepare to lock horns with the mills; for between them from hence must the shock of contest come.

This will further appear when we remember that in all probability American markets will not be troubled with foreign iron products, least of all, foreign ores. A comparison of the imports for the first four months of 1883 with those of 1882 shows a marked falling off this year—a falling off which is not likely to decrease after the tariff bill comes into play in July. And yet a Lancashire authority states that a movement in rails will set in at that time, although probably in no considerable volume. The facts are, ruling quotations have cut off foreign raw and manufactured iron, except it be in tide-water furnaces and markets, and here the profits are so small that it requires a powerful imagination to discover them. The Eastern manager of the largest of our lake mines recently remarked to your correspondent that, if current prices were maintained, no British pig could find its way as far west as Pittsburg. Taking into account the meager number of furnaces and mills on our Eastern sea-board, it may be safely said that, if things continue as they now are, the American market will be held by American mills and American mines. If there be any comfort in this, our mine operators can roll the morsel under their tongues to their heart's content.

The market for our lake ores, both lean and fat, turns accordingly upon the ancient hinges of supply and demand. Given the demand, and the amount of American ore which can safely be thrown upon the market is easy to be computed. A gentleman who has the very choicest facilities for obtaining the precise facts informed me, in a recent visit to the Peninsula, that not less than 500,000 tons of ore from last year's digging lay unsold or unused on the first of June on the docks of Cleveland alone. One of our mines which is already shipping an enormous block of ore from its winter stock-pile had 50,000 tons in the Cleveland yards, left over from 1882. From what your correspondent learns of the Illinois mills, he is led to infer that they are no worse off than their Eastern competitors. Indeed, so large an amount of ore or its equivalent is on hand in furnace markets that, had a strike been inaugurated on the first of June and continued for three months, it is not likely that a reinforcement of even a hundred thousand tons of ore would have been needed to fill all furnace orders until the opening of navigation in 1884. In the light of this fact, the present course of the mines, in sending down unsold ore, is, to say the least, dubious; for if more ore is piled up in Erie ports than buyers will take, the return of another year will find the ore question no less enigmatical and grave than this spring. As it is, we lake men have to confess that the mill-owners have no reason to be particularly anxious about supplies, and are not surprised, though we are somewhat discomfited, that they are taking things easy as regards making contracts for ore deliveries. One of our mines which had found buyers for over 250,000 tons by the first of March, 1882, has sold less than 30,000 tons thus far, and that in petty lots. The president of one of our great mines said to your correspondent recently, that a large mill had written an offer for a large block of ore at prices which would have been ridiculed last year. After consuming a week in conference with the directors, he mailed an acceptance of the offer, whereupon the furnace-men replied that their offer was not intended to hang fire so long, and that it was withdrawn. Now offers are mere bantering, "obstruction," so as to let the season wear on and the mines become importunate if not impecunious. Up to the first of June, no ore had been sold to speak of, by any or all of the mines. As a consequence, many of them have taken in sail and are "developing" their properties, and not at all rushing them. Your correspondent was astonished, on visiting one of the great Marquette County mines a few days since, to find literally no stoping at all going on. It would be tedious to recite the condition of the individual mines at this writing; but a canvass of them made about the first instant demonstrated the foregoing facts.

Concerning prices for ores, owing to the uncertain and fluctuating character of the market, there is nothing at all to be said in this letter, although I am quite certain that the prices quoted by your Cleveland correspondent were looked at by a microscope—none of us has seen them with the naked eye. Certain it is, that mine-owners will "look at" almost any offers that are not altogether unreasonable, and a few, though only a few, of them may be compelled to look at prices which are beyond reason. As a rule, however, the Marquette and Menominee mines have a splendid backing, and any furnace which calculates, by reason of the depression, to catch them on the hip, may find a Daniel come to judgment, which will turn the scales against the said furnace in vigorous measure. I have not attempted to moralize on the lessons which this prosaical study of the industry suggests, not more to our peninsular people than to the iron masters in lower towns. These lessons, however, are certainly important, and contain several harbingers of hope; but this, your correspondent modestly thinks, is beyond peradventure: the furnace-men and ore-men ought not to play dog eat dog, but to make common cause for mutual interests, lest in their wrangle they each furnish a cat's-paw by which the English *simiadæ* will help themselves to our American chestnuts. But of this more at another time.

SPECULAR.

ON MINERAL VEIN FORMATION NOW IN PROGRESS AT STEAMBOAT SPRINGS, COMPARED WITH THE SAME AT SULPHUR BANK.*

By Joseph Le Conte.

I recently visited Steamboat Springs for the purpose of comparing the phenomena there exhibited with those previously observed at Sulphur Bank and described in this Journal July last. These springs have already been described by Phillips and Laur.† I shall, therefore, give only such brief description as is necessary to make my comparison intelligible.

The springs are in Washoe County, Nevada, about fifteen miles south of Reno and immediately on the railroad to Carson and Virginia City. The place is, therefore, easily accessible, and, being a health resort, there are good accommodations for visitors. The springs issue in a narrow north and south valley, with volcanic ridges on each side, the vents being mainly on the slope of the western ridge. On nearing the place by cars, the attention of the traveler is strongly attracted by the clouds of condensed steam issuing from many vents over a bare rocky space about the hotel and extending northward a half-mile or more. On closer examination, the vents are seen to be separate, but occurring in linear series, showing that they are connected by continuous fissures. These fissures may be traced from vent to vent often as a vein, filled by a deposit of silica from the hot alkaline waters. The separate vents, especially at the south end of the fumarole area, are each on the top of a gently-sloping mound (some of which are from 15 to 20 feet high) formed by deposit from the water. The mounds, however, run together at their bases and form a continuous crust of silica. Toward the northern part of the area, the crust is still more evenly continuous. It forms here, in fact, a continuous rounded shell-like deposit, firm, hard, and ringing under the heel, about 200 or 300 yards wide, at least a half-mile long, and from 15 to 20 feet in thickness. This clean, hard, shell-like crust lies against the slope of the western hill and reaches to near the bottom of the valley.

We have said that about the hotel the vents are mostly separate but arranged on lines which were evidently fissures. These fissures are some of them open, some partly filled, but water still issuing from a narrow crevice in the middle, some wholly filled with deposit. The deposited silica occurs in almost every conceivable form—most commonly as tufaceous sinter in thin horizontal layers, sometimes with beautiful agate-like structure, sometimes milky chalcedonic, and sometimes saccharoid quartz. Everywhere the horizontal-banded structure is conspicuous, and in some cases the filling of fissures by successive deposits has given rise to a vertical banded structure like that found in veins. This structure, however, was by no means so conspicuous as I had been led to expect from the description of previous observers. The deposits in many places are stained and clouded with metals, especially iron oxide and cinnabar. Wherever the issuance of the hot water is still going on slowly, the silica is found in a gelatinous condition. Other observers have found in small quantities many other metallic sulphides, and even free gold is said to have been found in these sulphides. Here then undoubtedly mineral veins are now forming under our eyes, but their metallic contents are in very small proportion.

In the more northern portion of the fumarole area, as already stated, the crust is more continuous and extensive, and probably thicker. This part was therefore probably at one time the principal seat of fumarolic action, but the active vents are now very few. This whole area is intersected by a system of open parallel fissures of great size and differing somewhat from those already mentioned. They are seven or eight in number, and the five largest are at least half a mile long, a foot wide, about twenty-five feet apart, and apparently from 20 to 30 feet deep. They are tortuous, with rough ragged edges, and evidently reach to the bottom of the crust. Water does not now issue from them, but can be seen and heard seven or eight feet below, in violent agitation from the escape of steam and carbonic acid. There is no evidence that it ever issued from

* A paper read at the Washington Meeting of the National Academy of Sciences. From the American Journal of Science.

† Laur. *Annales des Mines* for 1863, p. 423. Phillips, *Phil. Mag.*, 1871, vol. xlii. p. 401

them ; for their sides and edges are sharply jagged like a fracture unmodified by subsequent deposit. The water in them seems to issue lower down to the east and north, where are found active vents and even feeble geyser eruptions which are said to have been more violent at one time than now.

It will be seen then that there are indeed here fissures filled and now filling with quartz veinstone of ribboned structure and containing metallic sulphides, yet these are not fissures and veins in the country-rock, but only in the *crust deposit*. The country-rock is completely buried under this crust, probably from 20 to 30 feet deep, and therefore completely concealed from view. The hot alkaline waters loaded with silica seem to have deposited so abundantly that they cover and choke up their own vents, while other vents are constantly formed by the expansive force of steam fissuring the crust previously formed. The great fissures described above were probably formed in this way, and perhaps opened by a slight bodily sliding of the crust toward the bottom of the valley. The analogy of the filled fissures to the veins is not so complete as I had expected, or as it is at Sulphur Bank. If we could get beneath the crust and find fissures in the country-rock filled by deposit, then indeed the analogy would be complete. This is exactly what we actually find at Sulphur Bank. In the immediate fumarole area, the country-rock is concealed ; but wherever not covered by deposit, its character is evident. On the hill slope and in the valley to the very margin of the deposit it is everywhere a quartz-trachyte or rhyolite. Along the crest of the western ridge, however, there is an outburst of black, very basic rock, probably basalt. This ridge is probably a basaltic dike breaking through a rhyolitic country-rock. It is not improbable that the fumaroles are the feeble remnants of a volcanic activity inaugurated by the basaltic outburst.

Cinnabar Mines in the Vicinity.—About a mile to the westward of the springs, cinnabar mines have been opened and reduction-works established. A considerable amount of cinnabar has been taken out, but the work is now abandoned. Here the surface appearances are entirely different from those at Steamboat Springs, and more like those at Sulphur Bank. There is no crust deposit; but, on the contrary, the whole hillside rock is decomposed by acid vapors into a white chalky earth like that at Sulphur Bank, except that in this case the rock being rhyolite, the chalky earth is full of disseminated grains of free quartz. Tunnels have been driven into the hillside at various levels and the ore extracted from the decomposed earthy matter, but the sound rock has not been reached. In this loose earth are found in considerable quantities both cinnabar and sulphur—the former in streaks as if deposited in water-ways, the latter more irregularly and widely distributed, as if formed by oxidation of sulphureted hydrogen gas. In some places, sulphates of iron and alumina are very abundant, even more so than at Sulphur Bank. There can be no doubt, therefore, that there came up, and probably are still coming up, hot waters containing alkaline carbonates and alkaline sulphides, carrying in solution and depositing sulphides of mercury and iron by cooling, and by oxidation depositing also sulphur and forming sulphuric acid. In a word, the phenomena are here very similar to those at Sulphur Bank, except that here the up-coming solfataric waters are less abundant and perhaps less rich in metallic sulphides. This, however, can only be determined with a certainty by deep explorations.

Comparison of Steamboat Springs with Sulphur Bank.—A comparison of the phenomena at these two places is interesting. The surface phenomena, it is seen, are very different; in fact, in complete contrast. At Steamboat Springs, the whole country-rock is covered from 20 to 30 feet deep and completely concealed by a hard crust of deposited silica ; at Sulphur Bank, on the contrary, there is no crust but only a soft chalky residue from the acid decomposition of surface rock—a residual silica which from the bases have been all extracted. The reason of the difference is obvious. At Steamboat Springs, the hot waters contain mainly alkaline carbonates carrying silica in solution, while at Sulphur Bank they contain also largely alkaline sulphides and carry metallic sulphides in solution. A crust can not form at Sulphur Bank, because the silica is not brought to the surface, the up-coming alkaline waters carrying silica being neutralized before reaching the surface by the down-going acid waters. The chalky residues of acid decomposition of the surface rocks, so conspicuous at Sulphur Bank, do not occur at Steamboat Springs, because the alkaline sulphides are in too small proportion to produce any conspicuous effects by oxidation ; whatever of rock decomposition occurs there, must be alkaline, not acid—by removal of silica, not of bases. Such alkaline decomposition doubtless does occur beneath the crust at Steamboat, as it does at Sulphur Bank below atmospheric influences. Again, since alkaline sulphides are the solvents of metallic sulphides, at Steamboat Springs the deposits are almost pure silica, only stained here and there with metallic oxides and sulphides ; while at Sulphur Bank, the metallic sulphides, especially mercuric sulphide, are in large quantity. At the abandoned cinnabar mines near Steamboat Springs, alkaline sulphides carrying metallic sulphides, again occur, but here again also, these are associated with the surface phenomena characteristic of solfataric waters.

At the California Geysers—so-called—we find also solfataric action with its invariable accompaniment of acid decomposition of the surface rocks with earthy residue ; but the freight of valuable metallic sulphides seems to be less abundant there, probably only because not met with in the course of the up-coming waters. Iron sulphide, however, is abundantly deposited. In *true* geysers, like those of Yellowstone Park and Iceland, the superheated waters contain usually only alkaline carbonates, and therefore carry in solution and deposit only silica.

Thus, then, we have a connected series of deposits from superheated waters, their characters depending upon the composition of these waters : 1. In true geysers, the waters, being pure alkaline carbonates, deposit only silica. 2. At Steamboat Springs, there are some alkaline sulphides, and therefore some metallic sulphides, but not enough to prevent a crust of deposited silica. 3. At the California Geysers—so-called—solfataric action is conspicuous, and therefore no crust is formed, but only earthy residue of acid decomposition of surface rocks. Here we have also metallic sulphides deposited, but these are of little value. 4. At the cinnabar mines, near Steamboat Springs, we have solfataric waters depositing cinnabar and other metallic sulphides in considerable quantity, but whether in profitable quantity can not be known certainly unless deeper explorations be undertaken. 5. Finally, at Sulphur Bank, the deposit of metallic sulphides is abundant and the formation of metalliferous veins is illustrated in the most perfect manner, on account of the deep explorations undertaken at this place.

In connection with the idea so common, that the metals are derived immediately from igneous rocks, it may be well to draw attention to the fact, that igneous rocks are by far most abundant and igneous action most conspicuous at Yellowstone Geysers and at Steamboat Springs, where there are little or no metals ; while at Sulphur Bank, the country-rocks beneath a depth of from 20 to 30 feet are stratified sandstones and shales of Cretaceous age, the igneous rocks being very superficial and evidently contributing nothing to the metalliferous deposits. It would seem that igneous *action* supplies a necessary *condition* (heat) for the formation, rather than that igneous *rocks* supply the *materials* of metalliferous veins.

GOLD MINING IN SOUTH CAROLINA.*

By E. Gybbon Spilsbury.

From time to time, for the last quarter of a century, considerable attention has been called to the gold deposits of North Carolina and Georgia, and much capital has been expended in their development ; but the existence of large areas of gold-bearing rocks in the State of South Carolina is known only to a comparatively few. The production of the South Carolina mines, being usually disposed of at the United States branch mint in Charlotte, has been generally credited to the North Carolina or Georgia mines. The mines of Lancaster and Chesterfield counties, South Carolina, have for years been as large producers as any in the neighboring States, and many of them have mint records of yields ranging in the millions. Before the war, most of these deposits were worked in a more or less desultory manner, down to about the water-level, and then stopped ; and it is only within the last few years that operations have recommenced in any of them. At the present time, even, there are only four mines of any magnitude operated in the State. These are, the Haile gold mine and the Funderbark mine, in Lancaster County ; the Brewer mine, in Chesterfield County ; and the West mine, in Union County.

I am aware that the general impression is not favorable to gold mining in the South, owing, doubtless, to the almost general failure of the many companies which have started work in this section. Still, to those who have studied the geology of the country and are acquainted with the auriferous deposits, it will not sound like exaggeration when I say that there is more money to be made to-day in gold mining in the Carolinas and Georgia, with a moderate outlay of capital, than in any equal area in California. The question very naturally arises then, Why, if this is the case, are there not more successes and fewer failures? The answer to this seems to me very plain. Under the old slave *régime*, gold-washing and mining were generally carried on in a very desultory manner and on a small scale, each land-owner just working on his own farm, using his overseer to manage his negroes in the mines as well as on the farm. Thus, both the overseers and negroes gradually obtained more or less knowledge of mining and milling such as they had seen on their neighbors' plantations, and which was of the most rudimentary character. After the war, when the attention of outside capital became attracted to these mines, these people became naturally the miners and foremen of the district. Their shiftless and desultory manner of working, which yielded profit enough to satisfy small individual owners, proved insufficient to grapple with the real difficulties of regular mining and milling, and hence arose the impression that the Southern ores were hard to mine, and harder yet to reduce. This cry was at once responded to by the patent process men, who came in swarms, each to be the deliverer from some terrible difficulty which the extraction of the gold from these ores presented. The process, when completed, would not always work right, and hence the inevitable collapse and general engendering of distrust in the value of the properties. As a fact, however, the average ores of the South present fewer difficulties of treatment than do those of the West, to any one who is at all acquainted with the requirements of the case. For instance, what would be thought in Colorado of a mining engineer who would put up a stamp-mill and amalgamation-works to treat cupriferous pyrites carrying gold? Yet I know of several cases where this has been tried in the South.

Another cause of failure has been the general exaggeration of the values of the ores. As a rule, the surface ores in this section are very rich, owing to a gradual concentration of the gold as the matrix is decomposed by atmospheric influences ; whereas the general deposits are of comparatively low-grade ores when once water-level has been attained. Of course, there are exceptions ; but this I find to be the general rule.

As the Haile mine is essentially a low-grade mine, and is still one of the largest bullion-producers, if not the largest, of the South, a short description of the mine and system of treatment of the ores may not be out of place.

The mine property, consisting of a tract of some 1900 acres, is situated in the southeastern corner of Lancaster County, South Carolina, about one and a half miles from the Kershaw line. The formation of the country-rock is talcose slate, having a general trend of north 18 degrees east. These talcose schists are tilted up on end, being in places nearly vertical, and nowhere having a dip of over twenty degrees to the northwest. They are throughout very highly impregnated with fine crystals of iron and arsenical sulphides. The beds of auriferous rock seem to follow in general direction the trend of the country-rock. There are at least two distinct mineral belts running in a parallel direction through the property. A series of trap dikes cuts through the slates almost at right angles ; and although there appears to be no lateral dislocation caused by these dikes, still they probably bear some intimate relation to the mineralizing of the belts they cross. The main or Haile deposit has been traced over a distance of three miles, and has been worked on for many years, down to a depth of about sixty feet. Its general width may be taken at sixty-five feet. The average value down to the bottom of the present workings, 75 feet from the surface, is about $11 per ton, although bunches of high-grade

* A paper read at the Roanoke Meeting of the American Institute of Mining Engineers

ores are sometimes found. The ore is undoubtedly an altered slate, and to an inexperienced eye differs very little from the surrounding country-rock. In reality, however, in composition it is nearer a quartzite than a talcose slate, the magnesia being replaced by silica, and contains in places near the center of the beds over 80 per cent of silica. From this, it gradually diminishes in hardness toward the walls, the foliations become thinner and more marked, interspersed with thin seams of pure quartz, until gradually the soft talcose slate is reached. There is no actual line of demarkation visible, except in a very few places near the surface. The amount of gold also diminishes very gradually, and indeed none of the surrounding slates within a distance of fifty feet on each side of the deposit is without more or less show of gold. From the size of the deposit, of course mining is very cheap, and the introduction of power-drills has brought the cost of extraction down to eighty cents per ton.

Across the valley to the north of this Haile deposit, is another parallel one of almost equal magnitude, known as the "Blauvelt vein," the characteristics of which are very similar. These deposits have been worked from time to time in a desultory manner for the last fifty years, showing, according to the mint returns, a yield of over one and a quarter million dollars. During the fall of 1879, the property was bought by the present company, and the work has been pushed steadily ever since.

The ore is hoisted from the mine up a slope, the same cars taking it down on an elevated tramway to the mill. The mill is an ordinary twenty-stamp, California type, the weight of the stamps being 750 pounds, and the average number of drops 80 per minute. The fall of the stamps is seven inches average. The screens used are forty-mesh. The amount of ore put through daily is from 35 to 37 tons. The average value of the ore is from $11 to $12 per ton. Of this amount, from $3.50 to $4 is free gold, the remainder being combined and more or less inclosed in the sulphides. The mortars are provided with inside plates, which are taken out and cleaned every day, yielding from $75 to $80 per day. Each battery is also provided with ten feet of copper plates outside, the average catch of which is about two thirds more than the inside plates. At the bottom of the plate-tables, I have put in a series of small spitzkasten, with an upward current of water, which I find very effective in catching whatever quicksilver is lost from the plates. All the tailings are then run over concentrators, whereby the sulphurets are saved, the average tailings which finally leave the mill showing less than thirty cents of gold per ton. Our entire cost of milling, including labor, cord-wood, wear and tear of machinery, and labor of concentration, is fifty-one cents per ton, to which should be added two pounds of shoes and dies to the ton of ore, say nine cents, making in all a total cost of 60 cents per ton.

The next process is the roasting of the concentrated sulphides, which, at the Haile mine, do not contain the faintest trace of copper. To effect this thoroughly, was supposed to be a matter presenting great difficulties, and a special furnace was designed to overcome them. This furnace consists of a large coil 450 feet long. of five-inch wrought-iron pipe, built in a suitable furnace, and heated to a low red heat. The finely-divided ore is blown through this pipe with a large excess of air into suitable receiving-chambers. Some of the mechanical details of this furnace are not yet perfected; but the roast made by it when working right is most complete, scarcely the faintest trace of sulphur being left in the ore, and it further has the advantage that, through the constant attrition of the particles of ore among themselves in their passage through the pipes, the gold is entirely freed from all scale, and left perfectly bright and ready for amalgamation. Like all mechanical roasters, however, this furnace can not be relied on for perfectly uniform results; and until this and other mechanical difficulties have been obviated, I have fallen back on the old-fashioned but always reliable "Fortschaufelungs" furnace. Here in the South, where labor is obtainable at 90 cents per day, where wood costs us less than $1 per cord delivered at the furnace, the advantages to be gained by automatic rabbling, in whatever way attained, are so slight that they are much more than counterbalanced by the perfect control one has all the time over the charge roasted in the reverberatory furnace. The advantages of the latter, in the matter of first cost, are of course undeniable. Our double-hearth furnaces, 40 feet long by 5 feet wide, do not cost us over $800 all complete, and have a capacity of from six to ten tons per day of twenty-four hours. Taking an average of eight tons per day, the cost of roasting does not exceed $1.10 per ton.

The roasted ores, after cooling, then go to our amalgamation-works, which, from their economy and success, deserve a special notice. It is, I believe, a well-established fact that the old Freiberg barrel process of amalgamation has always yielded as good if not better results than any other process, the great objection to it being the great length of time required for the thorough amalgamation of the pulp, owing to the difficulty of causing each particle of the gold to come in contact with the metallic mercury, and the consequent excessive flouring of the quicksilver. In order to obviate this, and cause a more thorough dissemination of the mercury through the charge, Mr. Designolle, a well-known French mining engineer, proposed using a solution of the bichloride instead of metallic mercury, at the same time placing in the barrel enough metallic iron to thoroughly effect the decomposition of the bichloride. This he found so thoroughly successful that he designed and patented a complete combination plant for treating ores by this process. At first, he claimed to be able to treat unroasted sulphides directly; but as a general thing, this claim has proved a failure. On the other hand, with roasted ores it has proved itself even more successful than was contemplated at first. The process is as follows: The roasted ore, in charges of 600 pounds each, is put into a cast-iron cylinder or barrel, in which are also placed about 1000 pounds of cast-iron balls. The cylinder is then partially filled with water, and about half a gallon of the bichloride of mercury solution is added. The barrel is then rapidly revolved for five minutes, at the end of which time another half-gallon of the solution is added, and the cylinder again revolved for fifteen minutes. At the end of that time, every particle of gold has been amalgamated, and the barrel is discharged into a large settler, in the concave bottom of which is a bed of metallic mercury. The pulp is kept in suspension in his settler by revolving rakes, which keep the surface of the mercury-bed clean and ready to absorb the particles of amalgam immediately as they settle. The pulp is discharged from this settler in a thin stream over a series of revolving centrifugal copper plates, which catch whatever particles of amalgam may still be held in suspension in it. From the plate machine, the pulp discharges into a second settler similar to the first one, thus finally catching what may have passed through the former settler and the plates. The simplicity of the whole process is remarkable. With our plant, costing in all less than four thousand dollars, including building, we can treat from eighteen to twenty tons per day, with the labor of one man and one boy. The whole cost of treatment at our mill, including chemicals, labor, steam, and wear and tear of machinery, is 38 cents per ton.

Having given a general outline of the manipulation of this process, it may be interesting to look into its chemistry. The composition of the standard solution used is as follows: Mercury bichloride, 1; common salt, 2; muriatic acid, 1. The proportion of the acid may be varied according as the gold in the charge to be treated is more or less rusty. These chemicals are mixed with any reasonable amount of water, with us the latter being in the ratio of 64 gallons to 8 pounds of bichloride, thus giving us one ounce of bichloride to the half-gallon of mixture. For all ores containing under three quarters of an ounce of gold per ton, one gallon of the mixture per charge is fully sufficient, after which half a gallon extra is added for each half-ounce of gold additional. The chemical reaction which takes place is $HgCl_2 + 2Fe = 2FeCl + Hg$. This simple reaction is due to the presence of the chloride of sodium in the mixture. Where this is not present, it is probable that the first reaction would be $HgCl_2 + Fe = HgCl + FeCl$, followed by a secondary reaction of $HgCl + Fe = Hg + FeCl$. It was therefore on the former reaction that Mr. Designolle based his invention. The extreme rapidity, however, with which the amalgamation takes place seems to point to some further action than the above, as we know that the decomposition of mercury bichloride by metallic iron is a comparatively slow process, and that the globules of mercury might revolve for a considerable time in the mass, as in the old Freiberg barrels, without coming in actual contact with the particles of gold. In point of fact, however, it is just this slowness of action which is the chief element of success of the process. Very little if any of the amalgamation, I believe, takes place by the particles of gold coming in contact with globules of free mercury, the secret of the whole success being that when, in the acid water-bath, any particle of the gold comes in contact with the iron, an electrolytic action is at once established, and the deposition of the mercury over the whole surface of the gold is instantaneous. It matters not how minute the portion of the gold exposed to the contact is, the whole of the surface is at once amalgamated. Even gold covered over with rust scales of iron, if exposed on one point only, will become thoroughly amalgamated throughout, the scale breaking loose, leaving the amalgam free. The action is indeed so rapid that, on ore containing $43 per ton showing freely in the pan before treatment, not a trace of unamalgamated gold could be found after the trituration had continued for ten minutes.

A few months since, my attention was called to Professor Egleston's paper on the defects of the stamp-mill, and the assertion made by him of the non-amalgability of hammered gold caused me much astonishment. After a careful series of experiments, I have come to the conclusion that the conditions of the gold under which Professor Egleston made his discovery must differ considerably from the general condition of the gold under the stamps, as in no case could I repeat his experiments with the same results as obtained by him. As the instantaneous amalgamation of gold by contact with iron in the bichloride solution is quite a beautiful sight, I have brought some of our standard solution with me, with some small plates of hammered gold, and as you will see, the instant the iron touches the gold, the mercury spreads like a vail over the entire surface.

COPPER SLIME TREATMENT.*

By F. G. Coggin, Lake Linden, Mich.

"If you could only get that motion into a machine," said a gentleman, as he watched the process of making a "van" on a shovel, and saw the copper roll up to the highest point, "it would beat the world for slime dressing." This idea has led to many an effort to get that peculiar motion, called the "vanning motion;" and so cams, eccentrics, eccentric gears, levers, bell-cranks, toggle-joints, links, springs, etc., have been brought into requisition, while a contribution has been laid upon all the conceivable motions, rolling, tumbling, swinging, jerking, tossing, dropping, tripping, intermittent, regular and irregular, or a combination of some of them, to which have been added percussion, concussion, and more discussion—all in a vain attempt to combine in a single machine the consecutive motions of the shovel, in washing, flowing, and tossing the van. The Patent-Office reports, and the various mills of the country, show, as a result of this, a lot of gimcracks, most of which never went beyond a first trial, finding their way to the scrap-heat. Others still running might as well be there; while some have considerable merit for dressing other and richer sands than copper.

It does look tempting to see that clean edge of copper climbing up the shovel-blade; but those who have seen in it such visions of large fortunes have not considered the time it takes to make a van, compared with the small quantity treated upon the shovel; and this points to the reason for the failure of all that class of machines called "vanning machines," when used for dressing copper slimes, namely, a lack of capacity. The writer has come to this conclusion through an experience with the Rittinger side percussion-table of the most improved make, sent from Germany to the Calumet & Hecla Mining Company, and with the Ellenbecker tables, used by the same company, both of which are good types of that class of machines. In both of these machines, the tables are suspended by rods which allow them to swing, and which can also be

* A paper read at the Roanoke Meeting of the American Institute of Mining Engineers.

adjusted for the purpose of varying the inclination of the table. In the Rittinger machine, the motion of the table is at a right angle to the flow of the slime, being produced by a wiper-cam which throws the table against a spring, which throws it quickly back against a stop, the percussion throwing up the mineral. In the Ellenbecker table, the motion is with the flow of the slime, and has a quick return, produced by the use of eccentric gears, the idea of the latter being taken from the valve-gear of the old Ball steam stamp. The estimated capacity of the Rittinger machine was eight tons per twenty-four hours; but it would not properly treat over five tons in that time, or about fifty pounds per square foot of floor space taken up by the machine. The Ellenbecker table has about the same capacity. The assay of slime was about 1·3 per cent; that of the tails, 0·97 per cent. This is not considered very good work.

Of other machines for dressing slimes, the best known are the fixed round buddle, the revolving table, and perhaps the Frue vanner may be included in this class of machines, although having had no experience with the latter, I can say nothing with reference to its capabilities. The principle governing the concentration upon both the former is the same. In the one, the table is fixed while the distributing and washing apparatus revolves. In the other, the table revolves while the rest of the apparatus is fixed. The revolving table is the most largely used in this country, the design of Mr. Evans, of the Atlantic mine, Michigan, being almost exclusively used in the copper mills of Upper Michigan. This differs little from the German revolving table except that it has a "dead-head" at the center from 6 to 8 feet in diameter, one half of which is used for distributing the slime, the other half being used for clear water. The outer rim of the latter is a spiral, the surface broadening toward that point where the concentration is washed off. I have also made this rim in steps of from six to ten inches, with good results.

It may be said that this dead-head takes up a large area from the table; but this area, being immediately around the center of the table, is of little or no value for settlement; for the current of the slime delivered at the center is too rapid for settlement to take place until it has spread itself over an area equal to that of the dead-head, the office of which is to spread the slime moderately and evenly upon the revolving table.

In a paper read before the Institute at its last meeting in Boston, by Mr. R. P. Rothwell, it was stated that in the German dressing-works the revolving tables were being superseded by the Linkenbach fixed round buddle for the apparent reason that the revolving tables, if over 17 feet in diameter, were expensive to build, were unwieldy, and necessitated more operations to concentrate. Some two years ago, a complete set of drawings of the Linkenbach buddle, with a set of irons for the same, were sent to the Calumet & Hecla Mining Company with a view to their introduction, the German estimate of the cost of a single buddle being $717. A thorough examination of the drawings, with their description, and of the irons sent, compared with the practical workings, etc., of the Evans table, led to the adoption of the latter for several reasons:

1. The cost. The Evans table, with only moderate facilities for its construction, will not exceed $225. The fixed buddle, with the inventor's estimate of the material and labor at prices paid for such in this section, would cost at least four times as much, or $900. This, for the number of tables required by the Calumet & Hecla Company to properly dress its slimes, would make a difference in first cost of $20,000.

2. The fixed buddle, with its revolving apparatus, is more complicated than the Evans table, and therefore more liable to repairs. If there was any thing to compensate for the extra cost of the fixed buddle, it would not matter; but there does not seem to be any thing. The capacity of the two machines seems to be about alike; that is, from 12 to 15 tons of slime (weighed dry) per twenty-four hours. This refers to a table 20 feet in diameter, as compared with those referred to by Mr. Rothwell, said to be about 26 feet in diameter. Comparing the capacity of the Evans table with that of the Rittinger percussion-table, per square foot of floor space taken up, the former gives 96 pounds of slimes against 50 pounds by the latter, a gain in favor of the Evans table, or round buddle, of 92 per cent. The water required by the buddle and table does not seem to vary much. Taking Mr. Rothwell's figures, the minimum, 5½ tons of slime in ten hours with 19 gallons per minute, gives about 2100 gallons of water to the ton of sand. Experiments with the Evans table give about 2000 gallons to the ton. There is no difficulty in making an Evans table 20 feet in diameter or more without making it unwieldy, and at a cost specified above. Nor is there any difficulty in putting one table above another, either on the same shaft, to be driven together, or on frame-work, to be driven independently; and in either case, the power to drive them is of no consequence, as the table revolves upon a steel step 1¼ inches in diameter, and a child could turn one even while loaded. With respect to the surface, those used in Upper Michigan being made of wood, have a wood surface which works very well. One table has a canvas surface, which is said to work well for certain grades of copper. I think that the best surface for the peculiar stuff to be treated can only be determined by experiment. I understand that in Germany much experimenting has been done in this line without fixing upon any one surface suitable to all materials and conditions; marble, slate, cement, wood, rubber, canvas, etc., each having been found best under as many variable conditions. This holds true with respect to nearly all machines, and many a machine that is doing its best in one place is condemned in another because it will not give as good results, under varying conditions, when perhaps only a slight modification in the machine itself was needed. As well condemn the saw that will not split the board it has so easily cut in two.

As to sizing the material for the table, I am not yet convinced as to the necessity for it, in copper dressing. It seems to me that the necessity for it is brought about only by poor separation at the jigs. With the separators usually used, the trouble has been that if enough hydraulic is used to keep the jigs free from slime, it carries over the tail of the separator a great deal of sand that should remain on the jigs, and which otherwise is detrimental to good work on the table. This is true of all separators where the excess of the hydraulic has to pass up through a narrow aperture, through which also the mineral must fall. I suppose as much effort has been made to secure a perfect separation as in any other line in mineral washing. Many have worked with a wrong end in view, and I may add in hydraulic separation, an impossible end, namely, a perfect sizing of the particles. Not only that, but for jigging purposes, a perfect sizing is not desirable, especially with the coarser sands; but as this is not within the province of slime treatment, I will not stop to discuss it.

However necessary it may be to classify the slimes, before going to the tables, it is certainly necessary to first get all the slime free from the sand that should remain on the jigs. I am glad to announce that this has at last been accomplished with the separator recently adopted by the Calumet & Hecla Company, and secured by letters patent. In the usual method of washing and separation, where the mineral has to drop through a narrow aperture, against a rapid and direct current of water, if the current is strong enough to keep back the heaviest particles of slime, it will also keep back the lighter particles of sand, suitable only for the jigs. Moreover, a great deal of the slime clings to the larger particles of the sand, and must be washed off in the separator if good work is desired. Heretofore I have seen no separator that would do this. In the new separator alluded to, the hydraulic is brought into each compartment from behind, by a pipe whose discharge is opposite to and near the spigot. Over this pipe and spigot is placed an adjustable shield which controls the hydraulic so that it reacts with a uniform current against the mineral seeking egress through the spigot, effectually washing all the slime from the particles suitable for the jig. This process being repeated at each spigot as far as carried for the jigs, carries away the slime, leaving the jig-tails perfectly clear, while the tables reveal the fact that no sand suitable for jigging has been carried over. This is a very important part of slime treatment. These results are accomplished with from fifteen to twenty per cent less water, which very much facilitates the subsequent treatment of the slime. This separator was more fully described in a paper read before the Institute at its last meeting in Boston, by Prof. Robert H. Richards, of the Institute of Technology in Poston. The slimes of the Calumet & Hecla assay from 1·2 to 1·3 per cent, the tails of the Evans table going away at about 0·05 per cent—results that are very good, considering that no free copper is found in the tailings. No matter how finely subdivided these sands may be, the particles still contain a finer particle of copper.

Thanks are due to the Calumet & Hecla Mining Company, which has been so liberal in its search for the best appliances, and which has seconded the efforts of those out of whose research and experience these results have come.

THE LAW AS AFFECTING MINING AND METALLURGICAL INTERESTS.

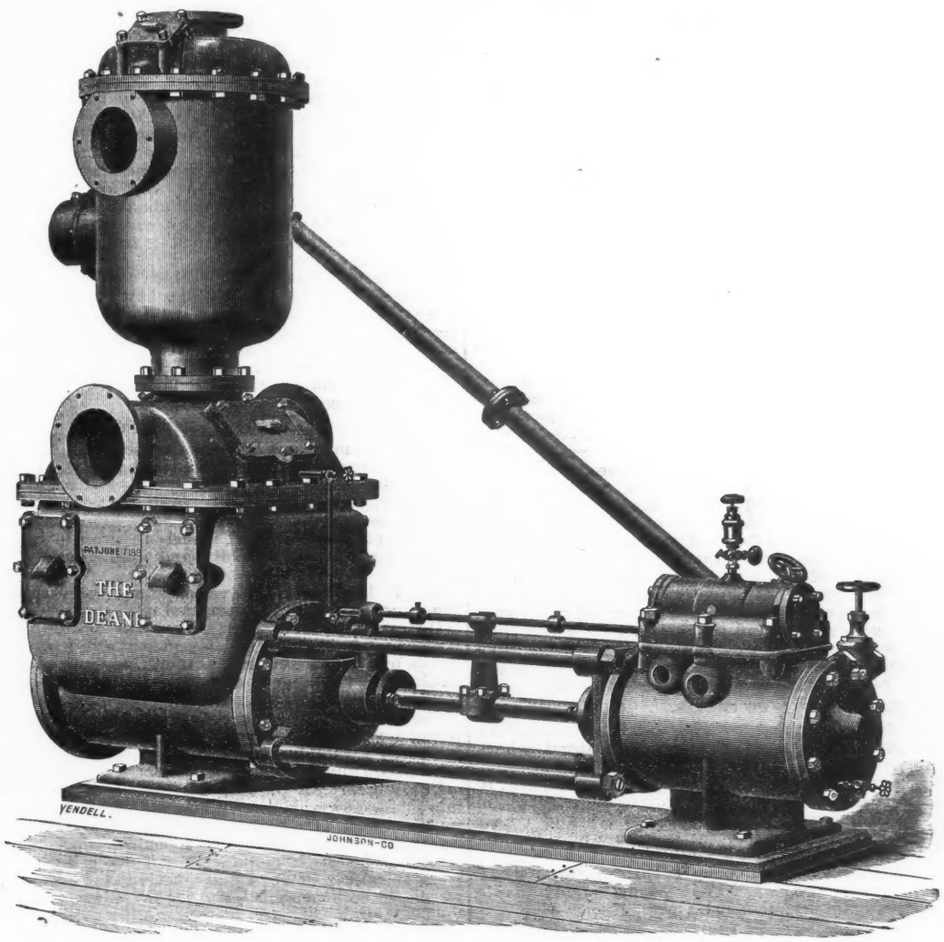
Unofficial Surveys.—The Wisconsin Mining Company, claimant of the Eureka lode No. 2, Colorado, protested to the Commissioner of the General Land-Office against the issuance of patent to John M. Cooper, for his claim upon the Chrysolite lode. The protest is in substance that "the published and posted notices failed to note as conflicting, as adjoining the prior claim of the Wisconsin Mining Company, which crosses the Chrysolite about five hundred feet from the eastern extremity. The plat and field-notes fail to show any conflict with the Eureka No. 2, although the latter had been previously surveyed, and neglected to indicate a thirty-foot tunnel, the property of the protestant, lying within the limits of the Chrysolite claim." By reason of these omissions, it is claimed that the protestant was unable, either by reading the published notices, or by an examination of the plat and field-notes, to ascertain or know, and did not ascertain or know, that said so-called Chrysolite in any manner conflicted with the Eureka No. 2.

The commissioner says: "The survey of the Eureka No. 2, though prior to that of the Chrysolite, was not official; and there is nothing in the regulations of this office that would require a deputy to note conflicting surveys other than those made by or under the direction of the Surveyor-General. The existence of such a survey in this instance may have been well known, and it could therefore have been readily noted; but such is not always the case; and to require that every survey, whether of record or not, shall be noted, would in many cases work unnecessary hardships, particularly if a failure to recognize such survey was held to invalidate the notice given to adverse claimants. The Surveyor-General may make regulations for the guidance of his deputies in the performance of their work; but a failure to comply therewith does not necessarily annul a survey, unless the same fails to conform with the law. The published and posted notices were, in my opinion, sufficient to have put the protestant upon inquiry, particularly when all the circumstances in connection therewith are considered. The Chrysolite claim must have been well known, both by name and reputation, to protestant, better in fact than the unofficial survey of the Eureka No. 2 could have been to the Chrysolite claimant. It is admitted that the published and posted notices were read with a view of ascertaining if any conflict existed, but this fact could not be ascertained. It is difficult to understand how this could have happened, how any one could have been misled when the name of the claim, of the claimant, the mining district, and county are all given, together with the names of claims on the northeast and south, and the course and distance to a well-known and neighboring rocky bluff. When these facts are taken into consideration, and it is also known that all the workings upon both claims are within three hundred feet of each other, it must be conceded that the relative positions of the two claims were known to protestant when the application for the Chrysolite was made, and that the notice given was all that the law contemplates as could be required thereunder. The real question to be considered is, Would the Chrysolite notice of application for patent have been misleading, had the Eureka No. 2 claim been unsurveyed, with no improvements belonging thereto lying within the Chrysolite boundaries, and said notice failed to give the gratuitous information as to a conflict, thought necessary by protestant? In view of what has been above explained, I do not think that such information could be reasonably insisted upon, the notice being already sufficiently specific, and hereby dismiss the protest."

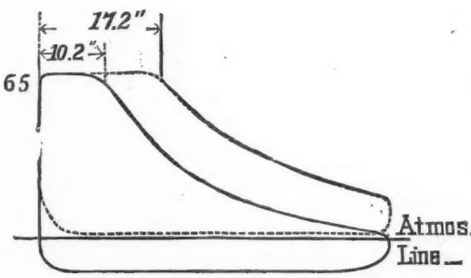
THE directors of the Pennsylvania Coal Company, numbering over fifty, with friends, arrived at Wilkes-Barre June 13th, on a special train from New York. The leading coal operators of the city tendered them a banquet and ball at the Wyoming Valley Hotel.

THE DEANE INDEPENDENT CONDENSING APPARATUS.

We present upon this page an engraving of the improved independent condensing apparatus for high-pressure engines, manufactured by the Deane Steam-Pump Company of Holyoke, Mass., and also a reproduction of two indicator-cards taken successively from the same engine with all conditions of load, steam pressure, and speed remaining constant; but the exhaust in one case being carried to the atmosphere, and in the other to the condenser. These diagrams, of which the originals, with many others of similar character, are on file at the company's office, show very clearly the great saving of steam effected by the application of the condenser. When the exhaust is carried to the condenser, the vacuum therein removes atmospheric pressure and other resistance from that side of the engine piston, thus practically adding to the force on the piston, and allowing less pressure, and consequently an earlier cut-off of steam on the opposite side, to develop a given power, a corresponding saving of steam being thereby effected. If an increase of power rather than a reduction of steam consumption is the end sought, the condenser is equally useful; for with the cut-off remaining constant, and the power due to direct steam unchanged, the pressure of the atmosphere will be added, and the actual power developed by the engine largely augmented.



The style and general arrangement of the Deane condenser is clearly shown in the engraving; but an explanation of construction and manner of application may be of interest. The air-pump and condenser are shown on the left-hand side of the cut, and the steam end which drives the air-pump at the right. Containing motive power within itself, this apparatus is entirely independent of the working parts of the engine, and, without adding in the least to the load, renders its assistance in the most practical manner conceivable by taking up the work on the piston where the engine has laid it down, and obtaining an additional percentage of energy from the steam. The condenser is of the jet type, of approved design, and carefully proportioned to its work. The injection-opening at the top is connected with a supply of cold water, and the opening at the side with the exhaust-pipe of the engine. The injection water flowing into the top strikes a perforated copper plate and descends in a shower to meet the current of exhaust steam rushing in through the side opening; condensation takes place, and a vacuum is produced or maintained, and the water continues its downward course into the pump, and is finally forced out through the discharge-opening in the air-cylinder cap and carried away by a suitable pipe. As this discharge-water has a temperature of one hundred degrees and upward, a portion of it is often used, if the quality of the injection supply admits of it, for boiler feeding, with economical results. A thoroughly reliable safety attachment on the condenser, shown below and at the left of the exhaust-inlet, is so arranged that, if from any cause water begins to rise in the condenser, the injection supply will be stopped, the exhaust automatically turned to the atmosphere, and the vacuum destroyed, thus effectually preventing accidents to the engine that have been so common with other forms of condensers. The air-cylinder of this apparatus is connected with the steam-cylinder by a set of polished wrought-iron tie-rods. The air-piston and steam-piston are connected by a suitable rod of composition metal, and where the rod enters the air-cylinder it is surrounded by a water-sealed stuffing-box, to prevent any leakage of air into the pump. The admission of steam to the steam-cylinder of this apparatus is controlled by mechanism of great simplicity, yet carefully worked out in detail. The valves are plain flat slide-valves, readily understood by any engineer, acknowledged to be the most durable of any, and when worn most easily repaired or replaced. The exhaust from this steam-cylinder is carried to the condenser, as shown in the cut, so that steam economy is secured at every point. It will be noticed that there are a number of hand-holes provided at suitable places on the air-pump and condenser, to give access to all valves and spaces. All valve-seats and bolts in the air-pump are made from composition metal, the air-cylinder is lined with composition, the piston is arranged for the use of patent fibrous packing, and we are informed that all working parts of both air and steam ends of the machine are made to gauge, and may be duplicated at any time with little delay or expense.



In regard to the practical value of the condenser in connection with the high-pressure type of engine, we suppose little comment is needed. It is generally acknowledged that where a supply of water for injection is available, no man can afford to run his engine with exhaust to the atmosphere.

The condensing apparatus here presented is a reliable and efficient machine, which has proved its merits by a number of years of practical work in all parts of the country, and on almost every style of engine, with success in every instance. On account of its independent arrange-

ment, it may be located in any convenient place in the engine-room, or, if preferred, in an adjoining room, or in another building, and the exhaust-pipe connected with it; and with no more care than an ordinary feed-pump requires, it will effect such a saving of steam as to render it emphatically a paying investment.

The amount of saving varies with different conditions and circumstances, but has been found in actual practice to be from 20 to 40 per cent of the total quantity required for a given power, due allowance being made for the steam used by the apparatus itself, or a corresponding increase of power may be obtained. The diagram given above was taken from a 20 by 48 Harris-Corliss engine, and shows a net saving of 38 per cent.

This apparatus requires no expensive foundation; it requires no head for the injection supply, and water twenty feet below the engine-room floor, or even more, if the condenser can be set below the floor, is available for this purpose. It is a first-class machine in every respect, and fully guaranteed by the manufacturers in material, workmanship, and operation. Further particulars in regard to this apparatus may be obtained from the Deane Steam Pump Company, Holyoke, Mass.

CRANES: A STUDY OF TYPES AND DETAILS.*

By Henry R. Towne, Stamford, Conn.

In the study of any special class of machines, it is often conducive to a better understanding of the subject clearly to enumerate the several types or forms in which the machine is used, and also to consider each of its more important details separately, rather than in their combination with other elements of the mechanism. It is proposed in the following pages thus to treat the subject of cranes.

The only English text-books descriptive of cranes are Glynn's, which treats of English practice in crane building as it existed more than thirty years ago, and sundry catalogues published by English dealers in machinery as a means of advertising the products of the various builders of cranes for whom they act as selling agents. The practice represented in the former is now almost obsolete, by reason of the improvements which have been effected, and the latter consist of little but a series of pictures of various cranes, without descriptive text, and with no information as to the details of their construction.

The building of cranes has long been recognized in Europe as one of the most important subjects in the field of mechanical engineering, and cranes of many forms are there seen applied to an almost infinite variety of uses. In America, on the contrary, cranes are but little used or appreciated, in comparison, at least, with the extent of their application in European countries. It is the purpose of this paper to present to American readers a brief classification and description of the most important types of cranes, and a similarly brief study of the more important elements entering into their construction, the object of the latter inquiry being to determine, if possible, the best forms of elements to be adopted.

With a better knowledge of crane construction will surely come a better appreciation of their economy and value as labor-saving machines. In hundreds of mills and workshops, heavy material is now moved and handled by manual labor at an expense so much in excess of the cost of doing the same work far more rapidly and conveniently by cranes, that the saving effected by the latter would yield an annual profit of from twenty to fifty per cent upon their first cost, while in many cases this outlay would be entirely repaid by the economy of one year's use.

CLASSIFICATION OF CRANES.

A *hoist* is a machine for raising and lowering weights. A *crane* is a hoist with the added capacity for moving the load in a lateral or horizontal direction.

All cranes, therefore, are provided with hoisting mechanism, and, in addition, must be capable of moving the load in one or more horizontal directions. This second function is effected in some types of cranes by simply pushing the load, in others by the operation of a distinct mechanism.

Cranes are most clearly classified by reference to their modes of transferring their loads horizontally; and, thus considered, are found to divide themselves into the following groups, namely:

1. *Rotary.*—In which the load is revolved around a fixed center, such as a mast or column.

2. *Rectilinear.*—In which the load is moved in straight lines in one or more directions.

Both types of cranes are subdivided into two general classes as to their movements, namely:

(*A.*) *Fixed.*—When their supporting members are fixed in some permanent location.

(*B.*) *Movable.*—When the crane as a whole can be moved about.

And into four other general classes as to their source of motive power, namely:

(*a.*) *Hand.*—When the motions, either vertical or horizontal, are effected by manual power.

(*b.*) *Power.*—When the motions are effected by power derived from line shafting driven by a stationary engine or other fixed motor.

(*c.*) *Steam.*—When the motive power is derived from a steam-engine attached directly to the crane itself and moving with it.

(*d.*) *Hydraulic.*—When the motive power consists of hydraulic pressure obtained from a pump or accumulator, and carried to the crane by pipes.

A further distinction is covered by the term locomotive, which is applied to cranes (usually of the rotary type) which are capable of propelling themselves upon a roadway or track.

Rotary cranes comprise the following principal types:

1. *Swing Cranes.*—In which the central mast is pivoted to the floor and roof of the building, and the load is suspended from a block fixed at the outer end of an arm projecting horizontally from the mast, the only horizontal motion being one of rotation.

2. *Jib Cranes.*—In which the central mast is pivoted to the floor and roof of the building, and the load is suspended from a trolley traveling in and out upon an arm or jib projecting laterally from the mast.

3. *Column Cranes.*—Which consist of a jib crane constructed to revolve around or upon a fixed column forming the support of a building or floor.

4. *Pillar Cranes.*—In which the central column or pillar is entirely supported by a heavy foundation built at its base, and the load is suspended from a boom projecting from the pillar and revolving with it or around it.

5. *Derrick Cranes.*—Which consist of a jib crane for yard use, the upper end or pivot of the mast being held in position by guy-rods or stays, instead of by attachment to a roof or ceiling.

6. *Walking Cranes.*—Which consist of a pillar or jib crane mounted on wheels, and arranged to travel by power or by hand upon one or more rails.

7. *Locomotive Cranes.*—Which consist of a pillar crane mounted on wheels, and provided with a steam-engine and boiler, the power of which is available for operating the crane and for propelling it upon its tracks.

Rectilinear Cranes comprise the following principal types:

1. *Bridge Cranes.*—In which a fixed bridge spans an opening, and the load is suspended from a truck or trolley capable of moving across the bridge.

2. *Tram Cranes.*—In which a truck or short bridge, from which the load is suspended, is arranged to travel longitudinally upon a pair of overhead rails, but is without capacity for transverse motion.

3. *Traveling Cranes.*—In which a rectangular space is provided with overhead tracks upon two opposite sides, and is spanned by a bridge arranged to travel longitudinally upon these tracks, the load being suspended from a truck or trolley capable of moving transversely across the bridge, so that the load may be moved to or from any point within the entire rectangle.

4. *Gantries.*—In which an overhead bridge is supported at each end by a frame or trestle extending downward and having wheels in its base to permit of travel upon two longitudinal tracks laid upon the ground so that the entire structure can move endwise upon the latter, and the load, which is suspended from a truck or trolley on the bridge, can be moved transversely across the bridge.

5. *Rotary Bridge Cranes.*—Which combine a rotary with a rectilinear movement and consist of a bridge having one end pivoted to a central pier or post, while the other or outer end travels on a circular overhead track or is supported by a gantry frame traveling upon a circular track upon the ground, the load being suspended from a truck or trolley traveling transversely across the bridge.

The above nomenclature will be adhered to in the following descriptions of crane construction.

HOISTING GEAR.

The most important factor in the economy and convenience of a crane is the mechanism by which the load is lifted and lowered, as it must necessarily come into action every time the crane is used.

In all applications of power, from whatever source derived, it must be remembered that the gearing of a machine can only modify the power applied in one of two ways, namely:

(1.) By reducing its velocity, and proportionally decreasing its force or "pull."

(2.) By increasing the velocity, and proportionally decreasing the intensity of the power transmitted.

Under no circumstances, unless the motive force is increased, can power be gained except by a sacrifice of speed, or can speed be increased except by a sacrifice in power. If either or both must be increased without diminishing the other, it can only be accomplished by supplying more motive power.

The function of gearing, then, is to change the force or direction of the power applied. If it is well designed and constructed, this may be done with only a small loss from friction; while, if badly made, the gearing may absorb much power in wasteful friction of its moving parts.

In machinery for hoisting, the "purchase," or conversion of velocity into lifting power, is usually effected partly by a multiplication of the ropes or chains of the tackle through which the load is suspended, and partly by gearing within the machine, which latter thus becomes an important feature in crane work. The gearing ordinarily used for this purpose consists either of spur-wheels and pinions, or of worm-wheels and worms, or both combined, and the smoothness and economy of power of the machine depend largely upon the manner in which the gearing is made.

A second feature of prime importance in the hoisting gear of a crane is the mode of sustaining the load, and guarding against its "running down" when the application of the motive power is discontinued. This has heretofore been accomplished, in machines having spur-gearing, by a ratchet-wheel, the pawl of which has to be entirely disengaged to permit lowering to occur, or by a brake which, when on, prevents all motion of the machine, and which requires to be held or thrown off both in hoisting and lowering. In machines having worm-gearing, the end is attained by a construction of their worm-wheels such that the friction between the worm and the wheel is sufficient to prevent the backward rotation of the worm under the pressure of the teeth of the worm-wheel caused by the load, the resistance thus generated sufficing to prevent the running down of the load.

The worm-wheel system is usually safe against accidents, but is not economical of power if the worm-gears are proportioned, as above explained, to hold the load suspended without running backward when the application of power ceases, as is usually the case. The spur-wheel system, on the other hand, is a constant and inevitable source of great danger both to the load and to the operator. With the least carelessness in lowering, the load begins to descend with great velocity, and the mechanism is driven backward with corresponding speed and violence. If not checked, the load then practically falls as if unsupported. If too suddenly checked, violent strain is thrown upon the entire frame of the crane and on its gearing, which latter is thus liable to damage, and even to "stripping" or fracture, in which event the load falls. Where spur-geared cranes are operated by hand, this "running down" of the load involves a reversing or "flying back" of the cranks, which then frequently strike the men before they can escape beyond their reach. Accidents of this kind, resulting in injury to limbs, and even in loss of life, are constantly happening with common cranes, and are reported almost daily in the newspapers.

It is possible, however, so to proportion worm-gearing as to place it

* A paper read at the Cleveland Meeting of the American Society of Mechanical Engineers.

almost, if not wholly, upon a parity with spur-gearing in regard to economy of power transmitted, and, by the use of cut worm-wheels driven by turned worms or pinions (the teeth of the wheel being formed by means of a chasing hob or cutter), so to construct worm-gearing that it becomes the best and most convenient form of gearing for use in crane mechanism. It is found that gearing thus made will not automatically support the load, and that the latter, if left suspended, will drive the worm-gearing backward; but in this case the descent of the load is quite slow, and no perceptible acceleration takes place, so that the worm-gears thus act as a governor to control the load. By the application of a small brake to the worm-shaft, this tendency is counteracted, and by connecting this brake with the levers which control the motions of the mechanism, the brake is easily made automatic, and thus securely holds the load whenever the crane mechanism is at rest.

In all cranes, except those of small size, provision should be made for one or more changes of speed in hoisting and lowering, so that the speed may be varied according to the load and the nature of the work to be done. Cranes operated by power *may* be so constructed that the maximum load can be lifted at the quickest speed; but they are usually so proportioned that this can be done only at a slow speed. By this plan, much economy of gearing, space, and cost is effected, and the practical efficiency of the crane for all ordinary uses is not impaired. The most perfect construction is one that permits a change of speeds to be made whether the hoisting gear is in motion or at rest, and which sustains the load automatically while a change of speed is making.

The hoisting gear of a crane should therefore attain the following results:

(1.) Such changes in direction and velocity of the power applied as will give the desired motions to the load.

(2.) The accomplishment of this with a minimum loss of power through friction.

(3.) The safety both of the operator and the load under all conditions; to insure which, the load must be always self-sustained and incapable of "running down."

(4.) Capacity for changes of speed and for convenient transition from one of these to another at will, whether the gearing is in motion or at rest, and for the automatic support of the load during the act of changing speeds.

TRAVERSE GEAR.

In this, as in the hoisting gear, good design and construction are essential to economy of power, and frequently to safety against accidents.

In some types of rotary cranes, no traverse mechanism exists, except an arrangement of parts which provides for the rotation of the crane. In others, such as jib and derrick cranes, provision must also be made for moving the truck or trolley horizontally on the jib, and the same provision is required for moving the trolley of bridge and traveling cranes transversely on the bridge. In all such cases, a separate mechanism, distinct from the hoisting-gear, has heretofore been employed, and is still sometimes desirable or convenient. When employed, its parts should be as few and simple as possible, and it should be so far independent of the hoisting-gear as to permit either to be used at any time separately or conjointly. In power cranes, provision should be made for accelerating the speed of the trolley travel whenever the nature of the work admits of it. The best possible result is attained when travel of the trolley is effected without varying the vertical position of the load, and without causing useless movement of the hoisting chain or rope over the sheaves through which it supports the load, which movement would involve much additional friction, and cause rapid wear of the chain or rope.

In traveling cranes, a point of great importance is the parallelism of the bridge travel with the longitudinal tracks. Any defect here results in increased resistance to traction, and any considerable error might cause derailment. In traveling cranes, as heretofore built, the use of flanged wheels has been relied upon to prevent derailment, and the propulsion of the bridge has been effected by a transverse shaft extending the whole length of the bridge, and connected by gearing with the truck-wheels supporting each end of the bridge, so that, by revolving the shaft, the truck-wheels would be rotated, and the bridge be thereby propelled, provided the adhesion between the wheels and the rails was sufficient. In some instances, where the adhesion has not been sufficient to prevent slipping, a cast-iron rack has been laid adjacent to the longitudinal tracks, and extending their whole length, and pinions, gearing into this rack, attached to the axles of the truck-wheels, so that propulsion is effected independently of the adhesion of the truck-wheels to the track. If the load were always central on the bridge, and the motive power always applied to this shaft at the center of its length, this plan would answer well, although it is somewhat clumsy; but in practice the load is constantly varying in position, and the motive power is applied at one end of the long transverse shaft, so that torsion of the shaft induces a considerable variation in the travel of the opposite ends of the bridge. This error is a constantly varying one, according to the portion of the load resting upon each truck, as determined by the position of the trolley, the load being never equally distributed between the two trucks, except when it is exactly in the center. It follows, therefore, that this system of bridge travel, although operative, is radically defective, and that its use involves a constant loss of power by needless friction, and entails a proportionate amount of wear and tear of rails, wheels, and driving gear.

A better and more simple method of bridge propulsion has lately been introduced, by means of which the longitudinal motions of the bridge are effected by *pulling* each of its ends, simultaneously and at equal speed, in the desired direction. For this purpose, light wire cables are used, which, by a very simple and ingenious arrangement of guide-sheaves, are made to act as a "squaring device," to hold the bridge at all times perpendicular or square to the tracks upon which it travels. By this system, the friction of traction is reduced to a minimum, and the danger of derailment from unequal travel of the opposite ends of the bridge entirely obviated.

From the above facts, it becomes evident that a perfect system of bridge propulsion must hold the bridge always absolutely square with its tracks, and must propel the opposite ends of the bridge in the same direction, at the same time and at the same speed, however, unequally the load may be distributed. It is desirable also that, in large cranes at least, provision be made for starting the bridge slowly from a state of rest, and then increasing the speed, and also for varying the speed while the bridge is in motion.

CHAINS VERSUS ROPES, AND CHAIN-WHEELS VERSUS DRUMS.

In almost every type of crane, the load is primarily carried upon a flexible cord of some kind. This usually consists of rope, either hemp or wire, or of chain. Each of these has distinctive merits and objections.

Ropes have the advantage of being formed of many parts or fibers, so that no splicing or welding is necessary in their manufacture; and they thus have an assured and practically uniform strength throughout their length.

Chains, on the contrary, consist of a series of independent links, each of which is formed from a straight bar, and welded, so that a single imperfect weld injures the whole, the strength of a chain being obviously limited by the strength of its weakest link. By care and good workmanship, however, this danger can be avoided, in which case the chains becomes as safe as the rope, and much more durable.

Where a rope is used, the hoisting-gear must necessarily include a drum or barrel, upon which the rope is wound up when hoisting takes place. Chains may also be thus wound up on a barrel, and this has heretofore been the common practice when chains have been employed in crane construction, and a prominent feature in cranes of large capacity has usually been a proportionately large "winding-barrel" to receive the chain. A chain, however, admits of another mode of construction, which consists in substituting for the wide barrel or drum a pocketed "chain-wheel," consisting of a narrow wheel or sheave, of a width only slightly greater than that of the chain, and having formed upon its periphery a series of indentations or "pockets," exactly corresponding in size and shape with the links of the chain, so that the chain and the pockets fit together accurately, and slipping of the chain upon the chain-wheel becomes impossible. It thus follows that rotation of the chain-wheel causes positive motion of the chain at a speed equal to the circumferential velocity of the wheel, in a manner precisely similar to the motion of a rack driven by a pinion, or of one spur-wheel driven by another.

To be used in this way, it is necessary that the chain should have a constant and uniform "pitch," that is, that all the links should be exactly alike, so that the distance from link to link shall be always the same (just as in spur-gearing the spacing or pitch of the teeth must be uniform), and also that the pitch or spacing of the pockets of the chain-wheel corresponds accurately with the pitch of the chain. If this be done, and if the chain have a cross-section of such area that, when carrying the full load, it is not strained to its elastic limit, or to a degree which will cause any permanent elongation of its links, then a chain may be thus used, in engagement with a pocketed chain-wheel, as well and as safely as on a barrel. Indeed, a properly shaped wheel of this kind is much easier on the chain than a winding-barrel or drum, for the reason that the latter has a cylindrical surface, while the bearing face of the former is not cylindrical but polygonal, the bed or bottom of each pocket being tangential to the radius at its center, and so presenting a flat surface for the parallel sides of each alternate link to bear upon. When the chain is wrapped upon a cylindrical barrel, on the other hand, the straight sides of every alternate link, being tangential to the surface of the barrel, can each touch it at one point only, the link being unsupported throughout the rest of its length, and the tendency of the strain induced by the load is to bend each of these links to the contour of the barrel. This effect may be easily seen in any chain which has been wrapped, under severe strain, upon a cylindrical barrel, unless the diameter of the barrel be very large. The spiral grooving of a barrel does not remedy this fault, although it affords a much better bearing for the chain than a plain cylinder; which latter is only permissible for small chains and light loads.

For heavy cranes, hemp ropes are rarely used, owing to the size and multiplicity of parts required, and to their rapid wear. They are also inadmissible where liable to be exposed to much heat, as, for instance, in a foundry. Wire ropes are more available, and are often employed; but these also wear rapidly, unless the sheaves and barrels around which they pass are of large diameter, while this requirement, if met, reduces the effective hight of hoist and necessitates more parts or gearing to obtain the necessary purchase, and augments the bulkiness of the machine. Either material involves resort to a large winding-barrel or drum.

The usual and best device for large cranes is a well-made chain, and this, when used with pocketed chain-wheels and sheaves, gives the best and most satisfactory results, and leaves nothing to be desired. The adoption of this plan dispenses with winding-barrels, preserves the shape, and therefore the durability, of the links of the chain, and in every way simplifies and compacts the mechanism.

The relative merits of the several systems may now be summed up as follows:

(1.) *As to the Sustaining Cord.*

Hemp Ropes.—Admissible only for small cranes not in frequent use and not exposed to the weather or to heat.

Wire Ropes.—Available under any ordinary conditions, but involving a winding-barrel of large diameter and large sheaves; not economical of space.

Chains.—Possessing, if well made, all advantages and the greatest durability; *common chain*, requiring a winding-drum, but permitting it and the sheaves to be of smaller diameter than with wire rope; *pitch chain*, dispensing with a drum and admitting of the use of a narrow chain-wheel.

(2.) *As to the Winding Device for Hauling in and Paying Out the Rope or Chain.*

Winding-Drums or Barrels.—These must have a diameter and length such as will enable them to receive the whole length of rope or chain to be hauled in by winding it upon their surface in one coil, without overlapping. In large cranes, the load is usually carried upon four, six, or even eight parts of rope or chain, so that the length to be wound up amounts to four, six, or eight times the effective hoist, and the dimensions of the barrel thus become very large. Moreover, this barrel must either be caused to travel longitudinally on its shaft, so that the rope or chain as

it leads off shall be always in the center of the crane and hoisting mechanism (which method of construction involves serious complication and greatly widens the space occupied by the gearing), or the rope or chain, as it uncoils, be permitted to vary in position from one end to the other of the barrel, in which case it is nearly always out of center, thus inducing objectionable lateral strains and causing greater friction and wear.

Chain-Wheels, with Pockets.—These require a width only slightly greater than a single part of the chain, and a diameter merely sufficient to give the proper engagement with it, so that both dimensions become much smaller than in a winding-barrel, and the total space occupied is but a small fraction of that required for the latter device. The *chain-wheel* is fixed in direct line with the chain, and all lateral strains are avoided, while the flat bearings afforded for the chain by the pockets preserve the shape of the links and protect them from bending strains. The slack chain, after passing over the wheel, falls into a proper receptacle below.

From this analysis of the facts is deducted the proposition that chains, if well made, constitute the best form of flexible cord for sustaining the load in a crane, and that a well-constructed *chain-wheel* (as contradistinguished from a winding-barrel) is the best form of device for hauling in and paying out the chain; and therefore, the best method of crane construction involves the use of these two elements.

To visitors to the anthracite coal regions, it will be of interest to learn that the Mansion House, of Pottsville, situated in the heart of the mountains, on the line of the Philadelphia & Reading Railroad, has been entirely and newly refitted, and placed in thorough and complete order for the accommodation of summer and permanent guests. The management is in the hands of H. Hardell, late of the St. Cloud and Girard House, Philadelphia, who will leave nothing undone for the comfort and pleasure of his patrons. As a family hotel and a mountain summer resort, it is gaining in favor rapidly. A mountain park, twenty-five acres in extent, adjoins the house, which is exclusively reserved for the use of guests of the house.

FURNACE, MILL, AND FACTORY.

The Altoona rolling-mill has started on full-time.

Lock Ridge furnace, of the Thomas Iron Company, has blown out.

In the Railroad Exposition, the North Chicago Rolling-Mill Company exhibited a steel rail 130 feet in length, the longest rail ever rolled.

The Keystone Iron-Works, at Reading, which have been idle for some time, have resumed work.

The Greenwood rolling-mill, which has been closed since the failure of C. F. Schoener, has been leased by Daniel Shepp and H. A. Weldy, and will be started this week.

The puddlers at the Porkhouse mill, in Alleghany, have struck for an advance of one dollar a ton for boiling hard iron.

The Manchester Mills have recently sent in their third order for Curtis steam traps, the one this time calling for thirteen.

The charter of incorporation of the Beckwith Carbon Company was filed in the recorder's office on the 7th inst. The company will be located at Pittsburg, and will manufacture carbon points and plates for electrical purposes and crucibles. The stockholders and directors are James Renwick, John Turo, James Reinhart, John Neeley, Charles Corcoran, J. F. Armstrong, and Walter Beckwith. The capital stock is $20,000, and the stock is valued at $50 per share.

The Phœnix furnace of Brown, Bonnell & Co., Youngstown, O., is again in blast.

The Rosena furnace in New Castle, O., is engaged in filling an order for 6000 tons of Bessemer iron.

A steam-hammer with a striking force of twenty-eight tons, and over thirty feet high, has just been completed at the hammer-works of Morgan, Williams & Co., in Alliance.

The Birmingham, Ala., *Age* says: Two years ago, only two furnaces were in the city; now, five furnaces are ready for business. Two years ago, the sites now occupied by Sloss furnaces Nos. 1 and 2, and Mary Pratt furnace, were only pine thickets; now, not only the three furnaces are there, but a little village has sprung up around them.

A. Garrison & Co., of Pittsburg, have sent a train of 3-high plate rolls, 31 by 112 inches, to the Springfield Iron Mill. They are building rolls for the Maumee Rolling-Mill Company, Toledo, O.

The Scranton Steel Company now has its works in Scranton in nearly full operation. In the rail mill, three steel rails are rolled at once, and four will be rolled at once when the mill is in full operation. The works use as fuel culm or coal-dust from a mine close by, which is burned on a patent grate. This fuel costs only ten cents per ton at the mine.

At the annual meeting of the Colorado Coal and Iron Company, the following were elected directors for the ensuing year: William J. Palmer, C. F. Woerishoffer, W. H. Hays, August Ruttan, John Scott, Henry Amy, D. C. Hodge, R. H. Lamborn, and H. H. Danforth. The annual report shows: Gross earnings, $4,175,313; operating expenses, $3,765,736; and net earnings, $509,577. The interest charges were $163,403, and premiums, discounts, bankers' commissions, and sundry old accounts charged to profit and loss, $138,112—a total of $301,515, leaving a net surplus of $208,062.

Powellton Furnace, near Saxton, Bedford County, is producing about seventy-five tons per day of the highest grade of iron, for which Mr. Powell finds a ready market, more iron being shipped in the month of May than any month since the furnace started. Mr. Powell intends to build a second furnace soon. He has ordered a new engine weighing 225 tons. He also intends to put up fifty more coke-ovens, making 155 in all.

The Bay View mills of the North Chicago Rolling-Mill Company have started, the scale having been signed. The furnaces will be lighted in the merchant mill, top and bottom, and in the fish-plate mill and puddle mills.

The Cambria Iron Company, of Johnstown, Pa., has received the contract for steel bombshells for the United States government, the metal to have a tensile strength of 90,000 pounds.

The bids for the new steel cruisers will be opened at the Navy Department July 2d. Secretary Chandler has given notice that the maximum amounts which the Navy Department will pay for the construction of these vessels are as follows: For 4300-ton ship, the Chicago, $1,248,000; for 3000-ton ships, Boston and Atlanta, $783,000 each; for dispatch-boat, not yet named, $399,000; and no bids in excess of these figures will be considered.

In passing by the works of the Cambria Iron Company, at Johnstown, Pa., recently, it was noticed that they were carrying a very heavy stock of ingots and blooms.

The well-known pump firm, Henry R. Worthington, has opened a branch at No. 95 Lake street, Chicago.

The Mahoning Furnace Company, of Armstrong County, Pa., made an assignment June 21st. The liabilities are $70,000, and the assets, it is claimed, $75,000.

At a meeting of the Western Nail Association on the 21st inst., to consider the advisability of curtailing the production by a suspension of operations, the matter was postponed till the next regular meeting, in consequence of some of the manufacturers desiring to replenish their stock.

It is understood that the directors of the Puget Sound Iron Company have in contemplation the building of a large rolling-mill at Irondale, Washington Territory.

The first meeting of stockholders of the Portsmouth Machine Company was held at Portsmouth, Monday, the 4th inst. It was voted that the capital stock comprise 1000 shares at $100 each, all of which has been subscribed. Frank Jones, C. H. Mendum, B. F. Webster, E. H. Winchester, William Ward, J. Albert Walker, M. Eldridge, N. W. Halley, and Edward S. Fay were elected directors. The company organized with Frank Jones, president; W. H. Hackett, clerk; Charles H. Mendum, treasurer, and proposes to erect a machine-shop.

The Pennsylvania Lead Company has contracted for the sinking of a well 4000 feet deep, with the hope of striking a vein of gas, with which to furnish heat for its smelting-works.

The Blakeney Foundry Company, of Springfield, Ohio, recently organized, is building extensive works at that place, for the manufacture of the Blakeney cupola-furnaces and general castings.

The Lewis Foundry and Machine Company (Limited), Pittsburg, Pa., is erecting an additional twelve-ton air-furnace in its malleable iron foundry.

The Richmond (Ind.) Foundry Company has been incorporated under State laws. The capital stock is $25,000, and the directors are Charles F. Coffin, Joseph Marchant, Charles H. Coffin, Turner W. Hayes, William F. Spencer, and William C. Shoemaker.

The Low Moor Iron Company, of Low Moor, Va., recently made a contract for a new double hoisting-engine, with double drum and cages complete, with W. H. Barber & Co., of Allentown, Pa. The engine was shipped about June 1st.

The Fall River (Mass.) Iron-Works will put in a new double Corliss engine of 350 horse-power, one side of which will run the puddling department and the other the plate mill. The old engines will be taken out and a new foundation laid. During the changes, a general overhauling of the machinery in the puddling department will be made. The alterations will require some six or eight weeks.

GENERAL MINING NEWS.

ALABAMA.

The Atlanta *Constitution* chronicles the fact that Colonel Peters, of Birmingham, Ala., has just sold 30,000 acres of mineral lands in Fayette and Walker counties to the Kentucky & Alabama Coal, Iron, and Land Company, for $99,600. The same gentleman had previously sold to the Tennessee & Alabama Coal and Iron Company 50,000 acres for $300,000. This was from the same two counties, and the purchasing company is composed of Nashville and Memphis investors. Their purchase embraces some of the best coal lands in the great Warrior field.

ARIZONA.

HOWELL SMELTING AND MINING COMPANY.—The company is said to be making remarkable progress. The Belle mine, which the company took under lease for three years, abounds in mineral almost from the surface, and in all of the extensive openings scarcely a foot of non-paying rock has been encountered. The company has upon the dump some 2600 tons of ore. To June 1st, the product was 1896 bars of gold and silver bullion, valued at $50,000, and the net profits are at the rate of $10,000 per month. It has been voted to increase the capital from 150,000 to 250,000 shares by an issue of 62,500 shares of preferred and 37,500 of common stock. The company also has the Blue Dick mine, but has no occasion to work it while so much ore is piled upon the dump of the Belle.

GRAHAM COUNTY.

The Clifton *Clarion* reports as follows:

DETROIT COPPER COMPANY.—The Copper Mountain, Arizona Central, Montezuma, and Yankie mines are the property of this company. It is the intention of the management to run two furnaces as soon as tramways can be erected to raise copper from ore-bodies now uncovered. A main working-shaft is to be sunk immediately on Copper Mountain, on which will be placed a hoisting-engine. An improved California whim is also getting into position on the Yankie mine. The mines of this company are very happily adjusted. The gangue of the ore-veins in Copper Mountain carries enough iron to flux the carbonate ores Arizona Central and Lower Yankie.

GREAT WESTERN COPPER COMPANY.—These mines are located on Rocky Creek, about two miles north of the town of Oro, on the Frisco River. Prospecting on this property has been done mainly on the claim called the Olie, which is an extension of the Copper King lode. The vein-matter is a decomposed quartz, well filled with iron pyrites, with granite walls. The work done at present consists of a shaft sunk on the foot-wall of the vein about 72 feet, encountering good ore at a depth of 33 feet. At 50 feet, a cross-cut was made to the hanging-wall, cutting a two-foot streak of rich copper glance ore and exposing a fissure-vein which, at a depth of 50 feet, is 13½ feet wide. It is the intention of this company to continue the shaft to the depth of 100 feet.

CHASE CREEK.—A strike of sand carbonates has been made on the Lulu, one of the mines of this group. A shaft is sinking which is down 14 feet on the vein. Heretofore the Lulu, which is a well-developed mine, has produced copper ore exclusively from its working tunnel, which is in 240 feet.

CALIFORNIA.

MONO COUNTY—BODIE DISTRICT.

BODIE CONSOLIDATED.—During the past week, 166 tons of ore were crushed; average assay value, $33.50 per ton. Work east and west on the 1000 level shows no change.

STANDARD CONSOLIDATED.—Last week, the company extracted 1311 tons of ore, and shipped to the company $33,787 bullion. East cross-cut, 1200 level, is 301 feet long, and is in hard ground. North drift, 1000 level, is 177 feet long. South drift, same level, is in 118 feet. The vein is from 1 to 2½ feet wide, and continues to look well. The uprise from the 700 level is up 131 feet, where the vein is 4 feet wide.

SYNDICATE.—The mill is running steadily on Syndicate ore.

PLUMAS COUNTY—GREENVILLE DISTRICT.

During the past three years, prospecting for copper has been done on the mountain east of North Arm. Last year, a ledge was found cropping out at an elevation of about 1500 feet above the stream; a shaft was sunk forty feet, to test the vein, and the result being satisfactory, a tunnel was started that would cut into it at an additional depth of one hundred feet. This tunnel has now reached the ledge, which is found to be of great width, probably forty feet; the ore is estimated to contain as high as forty per cent of copper. On the surface, the ledge crops out for a long distance.

OPHIR CONSOLIDATED.—This claim is east of the Indian Valley mine, and contains two ledges, named respectively the Ophir and Primrose; these run parallel to each other, and are about one hundred feet apart. North and south, the claim is bounded by patented ground. In sinking a distance of only ten feet in the Primrose, the ledge opened out to over three times the initial width. The prospects of the Ophir ledge are also very encouraging.

YUBA COUNTY.

MILTON HYDRAULIC MINING COMPANY.—The reservoir, containing 650,000,000 cubic feet of water, burst on the afternoon of June 18th. The rush of

water was irresistible, and swept away every thing in its path. It raised the Middle Yuba River 100 feet. The roar of the running water was heard at several miles' distance. Several lives are reported as lost. The loss on the reservoir amounts to $75,000.

CANADA.

PROVINCE OF ONTARIO.

DOMINION PHOSPHATE MINING COMPANY.—A large number of business men interested in phosphates met in Montreal recently, and organized a company for the purpose of phosphate mining.

COLORADO.

CHAFFEE COUNTY.

The marble discoveries on the northwest side of Monarch will be opened up for quarrying in a very short time. Such development as has already been done shows this new and valuable property to be of great extent, and the quality has been pronounced by experts to be very fine and beautiful. So far, the full extent has not been positively determined, but even at the presenttime such a large body has been uncovered as to warrant the employment of labor for the full development of it. Work upon it will be commenced in a short time.

OSHKOSH.—This property is but a short distance from Monarch, and of such easy approach that, at a small expense, its ore can be directly loaded upon the cars. Discovered in 1878, it remained in possesion of its locator till the following year, when development began, which has at intervals been continued up to the present time. After the discovery of the ore body was made, a tunnel of 135 feet was run, and ore taken out in sufficient quantities to prove beyond a doubt that the mineral existed in a large and well-defined body. Upon the resumption of work this spring, another tunnel was started, which, in a few feet, caught the vein, and is now, at a length of fifty feet, upon a body of ore, consisting of carbonates and galena. The mineral is upon the contact between blue and white lime, and as work proceeds is widening out and improving in value.

CLEAR CREEK COUNTY.

WORLAND MINING, MILLING, AND SMELTING COMPANY.—This company has expended large sums of money in opening up its mines and in building mills and smelters. The Freeland is worked through a tunnel that has now reached the great depth of 2700 feet. At the distance of 1200 feet from the mouth of the tunnel, a shaft was sunk on the vein to the depth of 480 feet. At a depth of 125 feet in this shaft, another level is run on the vein to the distance of 700 feet, and from this level stoping is done to the tunnel above. This mine has never heretofore been noted for the richness of its ores; but for the last 75 feet and in the breast of this level, ores of surpassing richness have come in. Franklinite, brittle silver, and carbonate of iron, the first and last heavy in gold, stand in great bodies from 3 to 5 feet in thickness. Of the amount of ore in sight, there could be mined daily 200 tons. The timbering in the mine is of the most substantial character. The timbering of the winze is in square sets. This company has a concentrator built at the tunnel entrance capable of handling 150 tons of ore per day of twenty-four hours, and in addition, in close proximity to the mine, is its smelter.

GILPIN COUNTY.

BOBTAIL.—A new process for the separation of the mineral from the tailings from stamp-mills has been placed in the stamp-mill of this company in Black Hawk.

EAST FLACK.—The lessees of this mine, south of the Hidden Treasure, will begin sinking in the main shaft, now 700 feet deep.

GUNNELL.—The production for the month of May was as follows: Retort gold, $4676.50; smelting ore sold, $8885.17; tailings sold, $209.83; total, $13,771.50.

ROLLINS.—Work has been resumed upon the placer claims of this company below Rollinsville.

WHITING AND BUTLER LODES.—Since the new lessees took hold of the Whiting, they have sunk the main shaft some distance, and are now sinking and drifting. The highest runs heretofore received from the stamp-mill dirt have been 3½ ounces gold per cord. In addition to the Whiting, which is a patented claim of 1300 feet, they have leased and bonded the Butler lode, a patented claim of 1100 feet. In the lower workings of the former, they have about eight inches of smelting ore, which is saved for the smelters. The outlook of both veins is encouraging, and improves as developments are continued.

LAKE COUNTY.

Late Leadville exchanges contain the following:

A. Y.—The first shaft on this property was started early in 1880. Since then, three shafts have been sunk to ore, hundreds of linear feet of levels driven, and thousands of cubic yards of ore and waste rock extracted. Inexpensive and modest as the plant on this property has been, it has handled incalculable amounts of water, and the mine up to the present time has produced 32,000 tons of ore, mostly of a fair grade. The latest developments consist of a new shaft, sunk several hundred feet north of any of the previous workings, and some distance higher up on the side of Iron Hill. The new shaft has lately attained a depth of 270 feet, striking ore and connecting with the workings of the mine from other shafts. The underground workings of the mine already extend nearly 100 feet north of the new shaft. A station has just been cut out at the foot of the shaft, and connection made on the west side. As soon as this work is completed, the sinking of the shaft to greater depth will be resumed, when levels can be driven intercepting the ore farther to the northward, in its dip below the present waterline.

CALIFORNIA GULCH.—The mines along California Gulch continue to make the largest production of any one section in the district. Beginning with the Robert Emmet mine and following the gulch to its head, a distance of nearly one and a half miles, almost every mine on the hills on each side is producing and shipping regularly. The largest production, of course, comes from the properties located on the Iron Silver belt where it crosses California Gulch, but very considerable amounts are also produced by the mining properties both east and west.

DUNKIN.—Thirty tons of ore, averaging thirty-two ounces per ton, were recently shipped. The mineral is sand, carrying some galena, and is surrounded by a low-grade iron. The ore was extracted from the northern portion of the mine, in which a great deal of exploration-work is in progress.

HENRIETT.—The north level from the incline running toward the mine has two to three feet of fine ore in a rise, and the prospects of a large body of ore in this portion of the mine are excellent.

MORNING STAR.—The sinking of the McHarg shaft has passed through the body of sand carbonates, and struck a mass of iron. The sand ore shows a thickness in the shaft of three feet. The water is coming into the shaft in such volume that the sinking has been suspended. It is now proposed to run a small drift for drainage and prospect purposes from the face of the lower Waterloo incline, connecting with the McHarg shaft. This drift will be about 125 feet in length, and it will require about thirty days to connect it with the shaft when the sinking of the McHarg is to be again resumed.

RUBY.—This mine has been sold to a St. Louis syndicate for $60,000.

SAMPSON & ESTY CONCENTRATOR.—This concentrating mill, situated in Big Evans Gulch, is now in fair running order. The perfection expected to be attained in concentrating ores, the result of practice and experience, has, however, not yet been reached, though better and more satisfactory work is done each succeeding day. At present, the capacity of the mill is limited to its crushing facilities; but as soon as the screens for additional sizing cylinders can be secured, the mill will be able to handle at least forty tons a day. So far, the works have been kept running on material from the Evening Star mine, which in its crude state returns but about four per cent in lead, and four ounces in silver to the ton. With such low-grade material, but very indifferent results can naturally be attained, and at best the product of the jigs and buddles is not very high.

SAN JUAN COUNTY.

It is stated that the North Star and Sultan have been sold for $475,000. Arrangements have been made by which the Martha Rose smelter will also pass into the control of the same company, which is said to be an English syndicate.

GUSTON.—This mine, situated on Red Mountain, has been sold to Eastern capitalists for $100,000. The purchasers propose to develop the mine extensively.

SUMMIT COUNTY.

The litigation between the Empire State and the Enterprise has assumed a new phase. Simultaneously with the nonsuit of the Empire State in the United States Court at Denver, that company instituted proceedings against the Germania Mining Company in the district court at Breckenridge. The question then arose whether the Germania Company should not be permitted to go on with its case in the land-office and perfect its patent, the owners of the Empire State having failed in their suit before Judge Hallett. Under the law, a party adversing an applicant is bound to bring suit within thirty days, and prosecute the same with due diligence. No decision has been rendered on the question, but it seems likely that the land-office will not forward the Enterprise papers to Washington. until the Empire State people have had an opportunity of establishing their claims before the district court.

CHAMPION TUNNEL.—In consequence of the withdrawal of steam from the Robinson, work had to be stopped at this mine. This property seems to get more deeply involved in trouble each week. At present, the interest of one of the lessees in the lease has been attached, and is to be sold under a judgment.

KEYSTONE BULLION COMPANY.—The works at Breckenridge have been started up. They were originally built and fitted up by the Summit County Smelting Company in 1880, but in consequence of litigation they were run only a few days. During last winter, a company was organized in Philadelphia with a capital of $100,000. The works were purchased, and have been thoroughly overhauled. The buildings are adjoining the town on the west bank of the Blue, occupying a commanding location. The machinery throughout is first-class, and together with the buildings cost the Summit County Smelting Company upward of $129,000. The principal source of supplies is the Union mine, on Mineral Hill, the Penn-Breckenridge mines, and the mines owned by Watson, Corning, and Boylan, on Nigger Hill, which furnish a sufficient variety for all smelting purposes. The owners of these extensive properties are also interested in the company. The location of the works is such that the grade is descending from all these properties, and also from the lime-rock ledges and source of fuel supply. There are now about 500 tons of low-grade ore at the works, and the capacity of the mines is sufficient to furnish a continual supply. The enterprise is now in good shape, so far as finances are concerned, the company having ample funds for the purchase of ore, and will, in addition to handling the product of the mines in which they are interested, conduct the business of sampling and purchasing ore in any quantity offered.

NEW YORK & SUMMIT COUNTY MINING COMPANY.—A correspondent of the Denver *Republican* writes that the company is getting through the large body of water that was encountered, and that it has now good prospects of soon reaching the main body of mineral that is before it, judging from the rich assays it gets from the small feeders in the wall. It is cutting through a large body of black quartz, carrying a large quantity of white iron, with copper pyrites, and has obtained assays from the feeders all the way from 30 to 350 ounces silver to the ton, and from $17 to $28 in gold per ton, 12 per cent copper and from 17 to 31 per cent lead. It is running a large force of men day and night. The company is determined to push the work.

ROBINSON.—The incline is flooded with water up to the 11th level. The mishap was partly due to the disabling of the great pump, but the surface water came in with such a flood after the incessant snows of April and May that no pump could have kept it under control. When the torrent subsides, it is expected that the mine can be pumped dry again in a day or two. Meanwhile, the ore-shipments for May were 92 cars, precisely the same amount as in April; and the shipments thus far in June are 16 cars, as against 11 cars for the same period last year. Nothing further has been done with the dry concentrator; about 100 tons of low-grade ore are shipping to the Greer concentrating-works at Kokomo. A dispatch from Leadville says that Mr. Greer, the lessee, has left there for New York. It is said that he will insist on a modification of the terms of the lease, and that, if he fails to obtain this, he will relinquish the lease. It is reported here that the mine has run behind.

WHITE QUAIL.—Work has not yet been resumed at this mine.

DAKOTA.

A dispatch from Deadwood says that intense excitement prevails throughout the Black Hills over recent discoveries of the greatest importance and value. The first was made about a week ago, but was kept quiet through uncertainty as to the character and value of the ore. Much development-work and many assays have since established the presence of tin in large bodies, running from 50 to 55 per cent tin and with traces of gold and silver. The mine is situated three miles from Harney's Peak, and is in a micaceous formation.

The second discovery was made in the St. Elmo, a gold mine six miles from Custer, near the Sidney stage-road. Work began on the mine two weeks ago, and was continued in good ore from the start. The ledge was cut to a width of 50 feet, and recently a streak of exceedingly rich ore was encountered. Pieces of rock pulverized, making less than a pan, yielded fully $40 gold. The ledge can be traced on the surface a long distance. Miners are flocking to the locality from every direction.

All the mills on the "belt," with the exception of the Gustin, are in operation.

A late dispatch says that little if any placer mining is under way in the Black Hills at present, owing largely to the destruction of flumes, ditches, boxes, etc., by the flood.

CALEDONIA.—The superintendent reports for the week ended June 10th: Ore produced, 1050 tons. Men on pay-roll, 112. The winze advanced 10 feet since work was resumed, making a total of 132 feet. About the last of this week, we shall have it down 100 feet vertical, when we shall begin drifting. The company is operating every stamp. Additional stamps will not be put in until the completion of the 200 level, which will, no doubt, demonstrate the propriety and necessity of increased milling facilities.

FATHER DE SMET.—The superintendent writes as follows, under date of June 4th: Herewith express company's receipt for bar No. 160, containing 848·15 ounces of gold, the result of run of mill for last half of May. This bar fully equals my expectations, as we were idle for three days on account of the flood, which filled open cuts, winzes, and tunnels with *débris*, which have all been cleaned up and run through the mill. We are doing much better now, and a good showing will be made for this month.

FLORENCE.—The enlarged silver mill will start up shortly.

NIGGER HILL.—It is reported that the forty-mile ditch scheme, begun a year ago, by this company, if not finally abandoned, is at least "laid over" for the season.

ILLINOIS.

MCWILLIAMS OIL COMPANY.—Oil has been struck in the company's new well, on the Simmon property, at Litchfield, at a depth of 675 feet. The oil is entirely free from water, and is pumped out at the rate of six barrels in twenty-four hours.

MEXICO.

The Consul of the United States, at Guaymas, Mexico, informs the Depart-

ment of State that of the miners from Arizona who, in the past three weeks, left that post for the Lower California gold placers, forty-five returned on June 10th. These men report that the placers contain little gold, and that their value has been grossly exaggerated; that the nearest water is twelve miles from the mines, and even then only enough for drinking purposes; that there is no pasturage for animals at or near the mines; and that they advise no one to go there with the expectation of making money; that the remainder of the miners are expected back in ten days, as they are waiting on the beach for a vessel; and this may be considered as ending the excitement in connection with the gold placers in Lower California in latitude 28° 29'.

SANTA EDUWIGES.—Ex-Senator Tabor, of Denver, has purchased this mine, situated at Jesus Maria, State of Chihuahua.

MICHIGAN.

NONESUCH.—The stamp-mill is nearly ready to begin work.

SALISBURY.—At the mine, the working force has been slightly reduced of late, and now numbers but about thirty-five men. There are in stock some 20,000 tons of ore, but a quarter of which has been disposed of as yet. Operations this spring have been confined to getting out rock, timbering, and placing the mine in shape to produce ore quickly and advantageously when it is wanted—a condition which has been fulfilled. The force is now taking out from four to five hundred tons per week, and the product for this season can be run up to 50,000 tons if it is called for. The policy of the management is, however, not to push the output beyond the immediate demand.

TAMARACK.—The vertical shaft had reached a depth of 750 feet at the end of last week—having been sunk at the rate of over 60 feet per month (average(since the start. It has passed through seven belts of amygdaloid, two of which carry copper.

MONTANA.

BEAVER HEAD COUNTY.

HECLA CONSOLIDATED.—The Butte *Inter-Mountain* gives the following information:

The Cleopatra, the highest mine on Lion Mountain, has now reached the depth of 750 feet. In the past two years, it has produced 32,000 tons of ore. The vein or ore-chute runs from 4 to 30 feet in thickness, with an average width of 15 feet. The Ariadne and Mark Antony are on the same claim. The Ariadne shows a large vein on the surface, and will be worked extensively the coming summer. The Silver Quartz now shows a large body of the best ore ever found on the mountain. Atlantis and Fissure mines are beginning to look up. The Fissure mine has furnished over 30,000 tons of high-grade smelting ore, and can be made to furnish as much more. All the ore of the Atlantis is now dumped into and run out of the tunnel. The Lion Mountain tunnel is now connected with the Atlantis, and will be continued until connections have been made with the Sheep, Fissure, and Silver Quartz. Two hundred and thirty-five tons of first and second-class ores are now run daily over the Hecla and Greenwood tramway, a distance of three miles. Thirteen cars are run to the trip, and are let down by six brakemen with comparative ease and safety. The concentrator works 200 tons daily of crude ore. It is the intention to start both furnaces up on the first of the month, and to load the ore teams at the concentrator.

LEWIS & CLARKE COUNTY.

The construction train and first locomotive of the Northern Pacific Railroad arrived at Helena June 12th, amid the shouts and rejoicings of the people.

NEVADA.

SAFFORD DISTRICT.

ONONDAGA.—The present developments consist of an original tunnel on the north side of the center gouge, run in 75 feet, and a cross-cut north from near the end of the tunnel 30 feet north and 25 feet south, thus cutting the ledge 55 feet in width. The cross-cut passes through low-grade vein-matter, with spots of high-grade ore throughout the whole distance. The ore-body continues beyond both ends of the cross-cut to an undetermined extent on the south. Another tunnel has been started on the south side of the above-mentioned gouge, immediately below Tunnel No. 1, and is extended in 75 feet. This tunnel shows high-grade ore in the breast and on both sides as far as carried. Still another tunnel has been started to cut what is supposed to be the main foot-wall of the ledge, which is well defined, cropping out 400 feet in length and stripped to that extent, showing a vein of very rich ore varying from a few inches to three feet, with ore of a lower grade on the south side extending indefinitely. At the northern end of this development, a considerable amount of ore has been extracted and shipped, varying from 60 to 300 ounces per ton. The ore on the tunnel ledge near the northwestern boundary of the ledge has been exposed 300 feet, showing a large continuous vein, the whole distance in ore varying from 20 to 1060 ounces. At this point, which is 650 feet from the mouth of the tunnel and 500 feet vertically to the tunnel level, a shaft has been started with which the tunnel is to connect. The mine has shipped 69 tons of ore, which have been reduced at Salt Lake with a pulp-assay of 92 ounces for the first lot and 76 for the second. The mine can be worked by a series of tunnels on the ore-veins to a distance of 1000 feet, with an uprise of 600 feet, and can thus be delivered on the dump without the necessity of hoisting or the pumping of water.

ZANOLI.—The mine is situated about a half-mile below the Onondaga. In most respects, as regards the country-rock and the formation, it is identical with the Onondaga. The ledge, which is perfectly defined, extends northwest and southeast as in the Onondaga. The property has been prospected by a tunnel run from near the northwestern extension of the ground, running southerly into the mountain 250 feet. This tunnel, near its mouth, passed through a vein of low-grade ore which gave indications of a width of at least forty feet. A winze has been sunk thirty feet down from a point about 35 feet from the mouth of the tunnel, all in ore. Two hundred feet easterly from the line of the tunnel, a shaft has been sunk 112 feet on the ledge. At the surface, it was only a few inches wide, the ore of which assayed but $1.80 per ton, but has widened gradually to the bottom, where it is fully six feet wide. The character of the ore is carbonate of silver, with a gangue of iron and sulphate of baryta, carrying from 10 ounces to as high as 600 to the ton in silver, without gold. Traces of ruby silver are discernible in the ore, which bears a strong similarity at the bottom of the shaft to that found in the lowest development of the Onondaga. At the depth of 50 feet, a drift has been run on the ledge westerly to a distance of 40 feet, all in gray carbonate ore that assays from 40 ounces up to 612. Taken out without assorting, the entire vein-matter assays over 70 ounces per ton. One car-load of 26 tons has been shipped to Salt Lake for reduction, which pulped 72 ounces.

NEW MEXICO.

In the north end of the Sandia Mountains, about four or five miles from Bernalillo, miners while sinking a shaft discovered a six-foot vein of plumbago or graphite. The experiments made thus far show that it is equal if not superior to an article of foreign importation sold in American markets.

The new camp Fleming, the discovery of which dates back but forty days, is reported to be growing rapidly, having already some four hundred inhabitants. The camp was at first brought into prominence by the discovery of the Penrose and Old Man mines; at the latter mine, thirty men are already employed, and the ore shipped to the Hubbs smelter shows rich returns. Various locations have been made, and high prices are demanded; and the boom which generally accompanies the discovery of so-called bonanzas is at hand.

PENNSYLVANIA.

Reports by telegraph from Titusville state that the Grandin well, No. 9, which is situated outside of the oil development in Balltown, was unexpectedly completed June 15th, and began to produce largely. In the first hour, it produced twenty-five barrels, but in the second hour increased to fifty-five barrels. During the first twenty-four hours, it will yield between 400 and 500 barrels. This will possibly open a large amount of territory which hitherto has been considered useless, as traders have regarded the limits of the Balltown District as defined. This strike creates much excitement.

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

GRANTED MAY 1ST, 1883.

276,576. Steam-Boiler or other Furnace. Charles Gearing, Pittsburg, Pa., Assignor of seven eighths to Samuel Harper, same place, and Henry P. Cooke, Lewis M. Hosea, and Charles F. Hesser, Cincinnati, O.
276,582. Stamp-Mill. Frank W. Hall, Dahlonega, Ga.
276,636. Furnace for Desulphurizing Ores. August Th. Schuessler, Newark, N. J.
276,691. Moving Grate for Boiler-Furnaces. De Witt C. Hill, Willimantic, Conn.
276,710. Dry-Ore Separator. Patrick W. Reardon, San José, Cal.
276,712. Machinery for and Method of Manufacturing Steel Railroad-Rails. Jacob Reese, Pittsburg, Pa.
276,738. Ore-Concentrator. William S. Ward, Leadville, Colo.
276,775. Ore-Concentrator. Alexander D. Clarke, New York City.
276,790. Hot-Blast for Blast-Furnaces. H. William Ellicott, Baltimore, Md.
276,861. Dry-Pressing Brick-Machine. Henry B. Morrison and George Willett, Motley, Minn.
276,903. Furnace for Steam-Boilers. Joseph G. Sextro, Carthage, O.

GRANTED MAY 8TH.

276,991. Brick-Machine. James C. Anderson, Highland Park, Ill.
276,997. Apparatus for Extracting Gold and Silver from their Ores. Richard Barker, London, County of Middlesex, England.
277,071. Crusher and Pulverizer. Morrill A. Shepard, Lebanon, Ill.
277,079. Reversing-Valve for Furnaces, and Device for Operating the Same. Henry Swindell, Alleghany City, Pa.
277,134. Crushing-Mill. Frank A. Huntington, San Francisco, Cal.
277,233. Ore-Crushing Machine. William Clark, Brooklyn, Md.
277,244. Rock-Drilling Machine. Henry Dunham, Glen Aubrey, N. Y.
277,277. Apparatus for Melting and Mixing Bituminous Compounds. Brierley D. Healey, Liverpool, County of Lancaster, England.
277,316. Amalgamator. Harrison B. Meech, Chatham, N. Y.
277,361. Steam-Boiler Furnace. Richard L. Slater, San Francisco, Cal., Assignor to Perkins H. Bagley, same place.
277,407. Furnace. Gustavus E. Buschick, Chicago, Ill., Assignor of one half to Charles E. Gregory, same place.
277,421. Brick-Kiln. Willis N. Graves, St. Louis, Mo., Assignor of one half to the Hydraulic Press Brick Company, same place.

GRANTED MAY 15TH.

277,491. Grate for Furnaces. Thomas Kirkwood, Chicago, Ill.
277,505. Process of and Apparatus for the Recovery of Turpentine and other Wood Products and for the Manufacture of Charcoal. H. M. Pierce, Chicago, Ill.
277,530. Machine for Separating Impurities from Coal. Charles W. Ziegler, Scranton, Pa.
277,538. Furnace-Grate. Christian H. Baush, Holyoke, Mass.
277,543. Rotary Crusher. David Bushman, Quincy, Cal.
277,578. Ore-Crusher and Pulverizer. James H. Kirkhead, Reno, Nev., Assignor of one half to Pierce Evans, same place.
277,638. Water-Bosh for Blast-Furnaces. Arthur F. Wendt, New York City.
277,661. Valve for Vapor-Burners. David E. Bangs, Medford, Mass.
277,666. Feed Mechanism for Ore-Crushers. Theodore A. Blake, New Haven, Conn.
277,746. Multiple Milling-Machine. William Krutzsch, Dayton, Ohio, Assignor to the Buckeye Iron and Brass Works, same place.
277,762. Hydraulic Mining Apparatus. John H. Martin, Bidwell's Bar, Cal.
277,763. Ore-Crusher and Pulverizer. Robert McCully, Philadelphia, Pa.
277,815. Rolling-Mill. Samuel T. Wellman, Cleveland, Ohio.
277,817. Metal-Punching Machine. Moses G. Wilder and Charles T. Parry, Philadelphia, Pa., Assignors to said Parry, Edward H. Williams, William P. Henszey, Edward Longstreth, John H. Converse, and George Burnham, same place.
277,831. Apparatus for Making Bessemer Steel. Thomas H. Barridge, St. Louis, Mo., Assignor of one third to William L. Reynolds, same place.
277,850. Casting Attachment for Open-Hearth Steel-Melting Furnaces. Charles M. Ryder, Chester, Pa.
277,869. Rolling-Mill. Samuel T. Wellman, Cleveland, Ohio.

GRANTED MAY 22D.

277,884. Method of Reducing Metals from their Ores. John Clark, Silchester Road, Kensington, County of Middlesex, England.
277,885. Method of Reducing Metals from their Ores. John Clark, Silchester Road, Kensington, County of Middlesex, England.
277,889. Amalgamator. Henry Cook, Leadville, Colo.
277,929. Process of and Apparatus for Converting Cast-Iron into Cast-Steel. Jacob Reese, Pittsburg, Pa.
277,978. Smoke-Consuming Furnace. George Blackburn, Columbus, Ohio, Assignor to the Standard Boiler and Smoke-Consuming Furnace Company, same place.
277,989. Water-Jacket for Furnaces. John H. Canavan, Globe, Ariz.
278,013. Art of Manufacturing Iron, Steel, etc. James Henderson, Bellefonte, Pa.
278,019. Pumping Apparatus for Deep Wells and Mines. John H. Huffer, Jacksonville, Oreg., Assignor of one fourth to C. C. Beekman, same place.
278,035. Amalgamator and Settler. Frederick Morris, San Francisco, Cal.
278,059. Amalgamator. George W. Strong and Walter L. Strong, San Francisco, Cal
278,080. Brick-Kiln. Jacob H. Beidler, Mount Pulaski, Ill.
278,093. Apparatus for the Manufacture of Gas for Illuminating and Heating Purposes. Amos P. Chamberlain, London, England.
278,107. Apparatus for the Manufacture of Gas. Joseph E. Dowson, Westminster, London, England.
278,145. Process of Generating Gas. Erazm. J. Jerzmanowski, New York City.
278,157. Coal-Hod. Emil G. Luscher, Bergen, N. Y.
278,160. Dry-Ore Separator. James Collins McCurdy, San Francisco, Cal.
278,168. Combined Gas-Engine and Air-Compressor. Lewis H. Nash, Brooklyn, Assignor to the National Meter Company, New York City.
278,209. Means for Burning Peat, etc., in Steam and Hot-Air Furnaces. William E. Wright, Rome, N. Y., Assignor to Anna Maria Wright, same place.
278,232. Pulverizing Machinery for Ores, etc. Willard M. Fuller, New York, Assignor of one half to F. S. Burr and J. B. Richmond, Brooklyn, N. Y.
278,234. Hot-Blast Stove. Frederick W. Gordon, Pittsburg, Pa., Assignor, by mesne assignments, to himself and James P. Witherow, same place.
278,250. Compound for Tempering Steel. John T. Mercer, Richmond, Ind., Assignor to himself, Edward F. Preston, Bismarck, Mich., and Samuel C. Richardson, Terre Haute, Ind.
278,279. Smelting-Furnace. Sherman G. Sackett, Denver, Colo.

REISSUE.

10,329. Gas Furnace. George H. Baldwin, Hollidaysburg, Pa.

GRANTED MAY 29TH.

278,340. Machine for Rolling Tubes, Columns, etc. Charles Kellogg, Buffalo, N. Y.
278,343. Dumping-Car. Sidney D. King, Pittston, Pa.
278,363. Basic Bessemer Process. Jacob Reese, Pittsburg, Pa.
278,407. Machine for Grinding Minerals, etc. Thomas O. Cutler, Jersey City, N. J.
278,451. Valve-Gear for Steam-Engines. Eugene O'Neill, San Francisco, Cal.
278,496. Means for Utilizing the Waste Heat of Furnaces. William H. Brooks, New York City.
278,511. Ingot-Manipulator. Thomas Critchlow, Pittsburg, Pa.
278,512. Soaking-Furnace for Ingots. Thomas Critchlow, Pittsburg, Pa.
278,517. Rock-Drilling Apparatus. George McC. Derby, New York City.
278,593. Method of and Mold for Casting Steel Ingots having Iron Centers. John Pedder, Pittsburg, Pa.
278,629. Machine for Making Spikes and Bolts. William Taylor, Pittsburg, Pa., Assignor to the Angular Steel Nail Company (Limited), same place.
278,663. Molding Apparatus for the Manufacture of Pipe. William Ireton and Samuel E. Whitelock, Camden, N. J.

FINANCIAL.

Gold and Silver Stocks.

NEW YORK, Friday Evening, June 22.

Although the volume of business in the mining market has not been as large as last week, the character of the dealings has been better and prices stronger. Sonora continues to do a very large business, and also continues to decline. Robinson has been very actively dealt in, and has been weak under rumors that the lessee of the mine has demanded better terms for his contract, and that, if they are refused, he will turn the property over to the company. The Leadville stocks show some strength, especially Little Chief and Little Pittsburg. The Comstocks have been weak under small transactions. Eastern Oregon has been very actively dealt in at stronger prices. The total number of mining shares sold at all the Exchanges aggregates 169,048 shares, as against 176,418 last week.

The Comstock shares were very moderately dealt in, and were weak. California was quiet and weak, selling from 35@27c. Consolidated Virginia sold to the extent of 1000 shares at 63@59c. Mexican was quiet and steady, selling at $3.75. Consolidated Imperial sold at 8c. Gould & Curry records transactions of 100 shares at $2.65. Yellow Jacket sold at $4, and Best & Belcher at $4.25. Sutro Tunnel was quite active, and was a little weak; it sold from 24@21c., the business amounting to 24,800 shares.

The Leadville stocks record a moderate business at strong prices. Amie was quiet and steady, selling from 16@18c. Chrysolite had a small business and was steady, selling at $1.20. Dunkin sold at 20c., and Hibernia at 5c. Iron Silver was moderately dealt in at steady prices, selling from $2.90@3. Little Chief was very active in the early part of the week, and has been quite strong; it sold from 55@65@63c., the transactions aggregating 10,600 shares. Little Pittsburg had a fair business at strong prices; it sold from 90c.@$1.10. Climax was quiet and strong, selling from 5@9c.

The Bodie stocks were quiet and steady. Bodie Consolidated sold at $1. Standard had a small business at steady prices, selling at $6.50@$6.75. Bulwer was quiet and strong, selling from 80@85c.

The Tuscarora stocks have been quiet and strong. Belle Isle was quiet and very strong, selling from 40@71c. Navajo, with moderate transactions, was strong; it sold from $2:10@$2.25. North Belle Isle sold at 20c., with a business of 400 shares. Independence was quiet and steady, selling at 60c. Elko Consolidated was dealt in to-day for the first time this week; it was quite active and strong, selling to the extent of 15,400 shares at 20@30c.

In the miscellaneous list, Alice has been weak under a small business, selling from $2.75@$2.50. Caribou was quiet and steady at 13c. Eureka had a small business at steady prices, selling at $3@$4, the latter assessment paid. Green Mountain records moderate transactions, and was steady; it sold from 75@72c. Homestake was quiet and steady at $15.50. Horn-Silver was quiet and a little weak, selling from $6.75@$6.50. Robinson Consolidated has displayed considerable activity at declining prices; it sold from 75@51@53c., with a business of 28,350 shares. Sierra Grande has had a fair business at irregular prices; it sold from $1.25@$1.05@$1.20. Stormont was very quiet at 40c.

Alta-Montana was quiet and steady, selling at 3c. Caledonia sold to the extent of 100 shares at $1. Central Arizona had a small business at steady prices, selling at 30c. Decatur was very active, and was steady, selling from 4@5c. Durango sold from 6@7c. under a small business. Eastern Oregon has been very actively dealt in at stronger prices; it sold from 36@48c., the transactions aggregating 13,000 shares. Harlem was quiet and steady, selling at $1.40. Lacrosse sold from 11@12c. Oriental & Miller had a small business, and was a little weak; it sold from 19@15c. Rappahannock sold from 10@8c., with a small business. Sonora Consolidated has had a very large business at weakening prices; it declined from 26@21@22c., the business amounting to 24,800 shares. South Hite, with a business of 100 shares, sold at 10c.

MEETINGS.

Caribou Consolidated Mining Company, No. 18 Wall street, New York City. Annual meeting of stockholders and election of trustees, June 28th, at twelve o'clock M.

Salerno Mining and Milling Company, at the office of the President, William H. White, No. 353 Fifth avenue, New York City. Annual meeting of stockholders, July 2d, at four o'clock P.M.

DIVIDENDS.

The Bassick Mining Company, of Colorado, has declared its regular quarterly dividend of $100,000, or $1 per share, payable June 26th.

The Bulwer Consolidated Mining Company, of California, has declared a quarterly dividend of fifteen cents per share, payable July 2d, at the office of the Farmers' Loan and Trust Company.

The Contention Consolidated Mining Company, of Arizona, has declared a dividend of twenty-five cents per share, payable June 28th.

The Osceola Consolidated Mining Company, of Michigan, has declared a dividend (No. 15) of fifty cents per share, payable at the office of the company, No. 69 Devonshire or No. 246 Washington street, Boston, July 2d.

The Hope Mining Company, of Montana, has declared a dividend of $1.50 per share, payable July 2d, at the office of the company, 417 Olive street, St. Louis, Mo.

PIPE LINE CERTIFICATES.

The petroleum market has been very active this week, and at times considerable excitement prevailed. Free selling checked the upward movement, and notwithstanding a published report that a syndicate had been formed to advance the price to $1.50, the market has been depressed. Yesterday, the market was quite strong, but to-day the prices went lower and the market closed weak.

News from the oil regions during the week states that on Saturday last Grandin Well No. 9 came in a large producer, giving 494 barrels the first sixteen hours. On Monday, the Union Oil Company's well No. 5 came in good for 400 barrels the first twenty-four hours, and well No. 6 for 150 barrels. The Murphy well on lot 441 was reported dry. Yesterday, a large well, Balltown No. 3, came in good for 500 to 600 barrels the first twenty-four hours. To-day's news is, that Union No. 7, farthest north of Herrick land, was finished yesterday, and proved a failure. It is reported that the Anchor Oil Company bought a million barrels of oil yesterday at the average $1.16 per barrel and that the syndicate retired 900 certificates from Oil City banks. Balltown No. 3 gave 800 barrels first twenty-four hours, although it is stated that it will probably weaken very rapidly.

The following table gives the quotations and sales at the New York Mining Stock and National Petroleum Exchange:

		Opening.	Highest.	Lowest.	Closing.	Sales.
June	16	$1.18⅞	$1.19	$1.17⅝	$1.19	1,182,000
	18	1.19⅛	1.19⅛	1.16⅝	1.16¼	2,109,000
	19	1.16¾	1.18	1.13¼	1.14½	2,583,000
	20	1.14	1.16⅜	1.13½	1.16	4,403,000
	21	1.16¼	1.19¼	1.15½	1.18¼	3,145,000
	22	1.18¾	1.18¾	1.16⅛	1.16¾	2,978,000
Total sales						16,400,000

Copper and Silver Stocks.

Reported by C. H. Smith, 15 Congress street, Boston, Stock Broker and Member of the Boston Mining and Stock Exchanges.

BOSTON, June 21.

The market for copper stocks this week has not come up to the expectations which were indulged in in our last report, which may be accounted for in part by the dullness prevailing in the general stock market, and the want of confidence in the future. Ingot copper is steady at about 15@15¼c. for Lake, but the demand is light; and although at these prices the producing mines can make a good show for dividends, provided they can market their copper, still there is no disposition on the part of the general public to invest very deeply in this class of security. The sales of Calumet & Hecla this week aggregate just 14 shares at $243@245, the last sale of one share being at $241, closing $240 bid, and $243 asked. The holders of this stock are evidently content with the returns made to them, and manifest very little desire to sell, while at the same time the demand for it is not sufficient to advance the price to any extent. Franklin declined from $10½ to $10, the old figure; only 300 shares changed hands. The promised dividend has not yet been declared, and there are some reasons to believe that it will not be made this year. Pewabic sold at $4, same as last week. Quincy has ruled extremely dull the past week; less than 50 shares sold at $49¾@$49½. Osceola declined on a small sale $19, but subsequently a lot of 100 shares was tak at $19½. The stock was in better demand to-day at $20 bid, with none offering. The rest of the list stupidly dull and inactive. The sales for the week, all told, were only a little over 500 shares; while the morning session of the Board to-day, not a singl transaction in mining stocks was recorded.

In silver stocks, there is much more activity. Bowman has been the feature at the Mining Exchange, and the prediction of last week has been fully verified, the stock selling to-day at 42c. per share against 17@22c. last week. The movement is purely speculative, as we are told there is nothing new from the outlook at the mine to warrant the advance. Catalpa did not hold the advance of last week, but declined to 60c. on sales of about 3000 shares. Sullivan has maintained a good degree of firmness, with sales of about 2000 shares at $2@$1¾, the latter price being bid. Bonanza, steady at $2½. Harshaw, 50c. Silver Islet sold at $4, an advance of $1 over last week.

3 P.M.—The afternoon market shows no improvement. A lot of 50 shares Quincy sold at $49; closing, $48 bid. Franklin was offered at $10¼. Catalpa, 60c. bid, 62½c. asked. Crescent offered at 25c. Sullivan sold at $1½ and bid, $1⅞ asked. Harshaw, 50c. bid.

SAN FRANCISCO MINING STOCK QUOTATIONS.

Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS. June 15.	June 16.	June 18.	June 19.	June 20.	June 21.
Albion						
Alpha			2¼	2	2	2
Alta	.65	.70		.65	.65	.65
Bechtel						
Belcher	1½	1½	1½	1½	1½	1½
Belle Isle	.20		.40	.40	.50	.60
Best & Belcher	5⅛	5	4¾	4⅞	4¾	4⅝
Bodie	1	1	1	1	1	1
Bullion						
California	.40	.30	.30	.25	.30	.25
Challar	3½	3⅜	3¼	3⅜	3½	3¼
Con. Virginia	.65	.60	.65	.60	.60	.60
Crown Point	1⅝	1½	1⅝	1⅝	1½	1½
Elko Cons	.15			.20		.20
Eureka Cons					3¼	4⅛
Exchequer	.40	.35	.40	.35	.30	.30
Gould & Curry	3¼	3⅛	3	3	3	3
Grand Prize	.30	.30	.25	.25	.25	.25
Hale & Norcross	7⅝	7¾	6⅝	7¾	7⅝	7⅝
Independence	.35			.30	.30	
Martin White						
Mexican	4	3⅞	3⅞	3½	3¼	3¼
Mono						
Mount Diablo				3	3¼	3¼
Navajo	2	2¼	2¼	2¼	2¼	2⅜
Northern Belle	6¼	6½	6⅜	6⅜	6⅜	
North Belle Isle						.45
Ophir	3⅜	3¼	3	3	3	2¾
Overman						
Potosi	1⅜	1¼	1½	1⅜	1½	1⅜
Savage	2⅜		2½	2½	2½	2½
Scorpion						
Sierra Nevada	6	6	5½	5¼	4⅜	4½
Silver King	10½		10½			
Tip-Top						.45
Union Cons	7⅛	7½	6¼	5⅜	5⅜	5¼
Wales Cons				.25	.25	.40
Yellow Jacket	4½	3⅜	4⅜	4¼	4½	4⅜

BULLION MARKET.

NEW YORK, Friday Evening, June 22.

There has been an active inquiry for silver in London the past week, resulting in an advance there and here. But for the weakness of our sterling exchange market, the figures here would be higher.

DATE.	London Pence.	N. Y. Cents.	DATE.	London Pence.	N. Y. Cents.
June 16	50⅛@50¼	109⅞	June 20	50⅜@50½	110⅜
18	50¼	109⅞	21	50 9-16	110½
19	50¼	110	22	50⅜@50¾	110⅝

Bullion Receipts at New York.—The bullion received from the mines at the various offices in this city during the week ended June 22d, as compiled from various sources, amounted to $131,000, as against $151,000 reported for the previous week. The receipts from January 1st, 1883, to date are $5,691,713.53.

Foreign Bank Statements.—The governors of the Bank of England, at their regular meeting, made no change in the bank's minimum rate for discount, and it remains at 4 per cent. During the week, the bank gained £697,000 bullion, and the proportion of its reserve to its liabilities was raised from 39¾ to 41 per cent, against 46 1-16 per cent a year ago. June 21st, the bank made a further gain of £150,000 bullion on balance. The weekl statement of the Bank of France shows a loss

16,000 francs gold, and a gain of 2,875,000 francs silver.

Exports and Imports of Gold and Silver at New York.

Exports.

Week ended June 16th	$108,870
Corresponding week last year	1,162,386
Since January 1st, 1883	6,054,604
Corresponding period last year	32,846,385

Imports.

Week ended June 16th	$49,142
Corresponding week last year	73,893
Since January 1st, 1883	6,788,225
Corresponding period last year	1,868,642

BULLION PRODUCTION FOR 1883.

We give below a statement showing the latest bullion shipments. These are officially obtained from the companies, where that is possible; and where official statements can not be procured, we take the latest shipments published in those papers nearest to the mines reported. The table gives the amount shipped for the week up to the date given, as well as the aggregate shipments to such date from the first of January, 1883.

The shipments of silver bullion are valued at $1.29·29 per ounce troy; gold at the standard $20.67 per ounce troy. The actual value of the silver in the following table is therefore subject to a discount, depending on the market price of silver. If the price of silver be counted at $1.11 an ounce, which has for some months been about its average value, the following figures, where they relate to silver bullion, should be diminished by about 14⅓ per cent, to arrive at actual value.

MINES.	States.	Month of May.	Year from Jan. 1st, 1883.
*Alice, G. S.	Mont		$320,419
*Alta-Montana, G. L. S.	"		$10,625
*Belmont	"		17,775
Bodie, G. S.	Cal	9,248	100,590
Bodie Tunnel, G.	"	6,128	51,447
*Bonanza King, G.	"		199,077
*Boston & Montana, G.	Mont		72,318
*Central Arizona, S.	Ariz		35,845
*Christy, S.	Utah		92,654
*Chrysolite, S. L.	Colo		142,238
Cons. Bobtail	Colo		18,723
*Contention, S.	Ariz		383,014
Crescent, G.	Cal		13,000
*Custer, G. S.	Idaho		43,572
*Deadwood-Terra, G.	Dak		120,231
*Dardanelle Blue Gravel, G. S.	Cal	12,885	44,729
Evening Star, S. L.	Colo		47,061
*Father de Smet, G.	Dak	13,972	141,957
*Frisco M. and S. Co., G. S. L.	Utah		$77,084
*Head Center Cons.	Ariz		6,865
*Head Center and Tranquillity	Ariz.		18,486
*Hecla Cons., G. S.	Mont		234,984
*Homestake, G.	Dak.		330,060
*Hope, S.	Mont	228,000	20,574
Horn-Silver, S. L.	Utah		1,283,000
Idaho, G.	Cal		88,642
*Independence, G. S.	Nev		34,722
Iron Silver, S. L.	Colo	127,109	503,831
*Kentuck, G. S.	Nev		8,237
*Lexington, S.	Mont	109,629	530,833
*Little Pittsburg, S. L.	Colo		22,873
*Marguerite, G.	Cal		33,200
*Martin White, G. S.	Nev		136,317
Morning Star, S. D.	Colo		84,428
*Moulton, G. S.	Mont		123,288
Mount Diablo	Nev	52,233	127,311
*Navajo, G. S.	"		281,626
*North Belle Isle	"	45,510	1,953
Northern Belle, S.	"		388,525
*Ontario, S. L.	Utah		807,695
*Oxford, G.	N. S.	6,855	28,179
*Phœnix, G.	S. C.		†3,666
*Pinal Cons., S. L.	Ariz	25,540	163,400
*Satemo, G.	N. S.		2,500
*Silver Bow, G. S.	Mont		101,241
Standard, G.	Cal	71,313	442,796
Star, S.	Nev		27,095
*Stormont, S.	Utah	21,377	95,658
Syndicate, G.	Cal	5,987	20,073
Tintic M. and M. Co.	Utah		7,632
*Tip Top, S.	Ariz		‡22,983
*Tombstone, G. S.	"	76,600	§322,830
Yellow Jacket, S.	Nev	30,191	183,064
Total amount of shipments to date			$8,511,225

* Official. † Net value. ‡ Assay value. § Not including value of lead. *G. Gold. S. Silver. L. Lead.*

METALS.

NEW YORK, Friday Evening, June 21.

Copper.—Business has been very quiet, as it naturally is after the large consumers are well supplied. Although nominally held at 15½c., Lake copper is offering as low as 15⅛c. in moderate-sized lots, and better bids than 15c. are not obtainable. Other brands are dull, 14½c. being asked for Arizona, but there is no buying, and outside brands do not range better than 14@14⅜c., with the market in buyers' favor so far as less well-known brands are concerned. It is not probable that the struggle for placing these brands will be so severe at such prices as it has been, because the figures which can be realized by shipment to England are relatively much better than they were.

The Board of Trade returns for the first five months of the year are as follows:

	Jan. 1 to May 31. 1883.	1882.	1881.
	Tons.	Tons.	Tons.
Imports:			
Pure in pyrites	7,402	6,938	5,803
" precipitate	9,106	7,158	8,800
" ore	5,680	4,851	4,560
" regulus	4,135	3,229	2,011
Bars, cakes, etc:	14,800	14,034	10,992
	41,123	36,210	32,166
Exports:			
Raw (English)	7,479	4,550	7,533
Sheets	6,617	6,238	5,754
Yellow metal at 60 per cent	4,764	4,585	3,702
Brass at 70 per cent	1,424	1,282	1,251
	20,284	16,655	18,240
Foreign	4,784	4,813	4,575
	25,068	21,468	22,815

Tin.—The week has been a dull one, with quotations at the close at 20¾@20⅞c. cash for spot Straits and Malacca; 21⅛@21⅛ for Australian; and 21⅛@21¼ for Lamb & Flag. England cables at the close £93 15s.

Lead.—There has been considerable activity during the past few days, sales of Common and Corroding aggregating 1000 tons, including present, July, and August delivery, a little in the beginning at 4·40c., but the bulk at 4·42½c. The lead has been quite widely distributed, and has been sold by a number of parties. In spite of the heavy and comparatively dull trade, the metal is well maintained.

Messrs. John Wahl & Co., of St. Louis, wire us as follows to-day:

There is no change of any description in our market. Sales aggregate 230 tons of Refined at 4·13c. There have been no sales of Hard lead, which is nominally 4·12½c.

Messrs. Everett & Post, of Chicago, send us the following dispatch:

Our market is quiet and firm; we note sales of 300 tons of Common and Refined at 4·15c. and 4·17c., and one hundred tons at 4·20c. It is noticeable that there is more demand.

Spelter.—This metal continues quiet and dull, with quotations at 4·40@4·50c. for ordinary to good Domestic, and 5⅛@5·15c. for Silesian.

Antimony.—Some small spot lots are pressing on the market, which we quote: Hallett's 9⅝c., and Cookson's 10⅝c.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, June 21.

American Pig.—The principal feature in the market is the comparative scarcity of No. 1 Foundry. Though the leading makers still carry stocks figuring by thousands of tons, the bulk of the metal they hold is No. 2 and Forge, so that there has been a stiffening tendency in the best known brands of No. 1, some of which are bringing as high as $22 at tide-water. Ordinary brands are still quoted low, in some instances, $19.50. In No. 2, the supply is more than ample, and we can not note any marked improvement; but the feeling seems to prevail that bottom has been reached. We quote $18.50@$19 for good to standard brands, while Gray Forge is unchanged at $17.50@$18.50. There is nothing to report in Bessemer pig, which is selling at $21.25@$21.50, while England quotes by cable 50s.@51s. 6d. Spiegeleisen is fairly active at $31@$31.50 for 20 per cent, and $25.50@$26 for 10 to 12 per cent.

Scotch Pig.—The better feeling in the higher grades of American Pig has given encouragement to importers of Scotch pig, though they can not as yet record any business worth mentioning. Arrivals are light, and the fact that under the new tariff there will be heavier freight engagements on goods generally, is giving a firmer tone to freights, which are now from 6s.@7s. 6d. At the Exchange, the following cable quotations were received yesterday: Coltness, 60s. 6d.; Langloan, 59s. 6d.; Summerlee, 57s.; Gartsherrie, 58s.; Glengarnock, at Ardrossan, 54s.; and Eglinton, at Ardrossan, 48s. 6d. Warrants to-day were 47s. 1d. We quote here, all ex ship, Coltness, $24@$24.50; Langloan, $24; Summerlee, $23.50@$24; Gartsherrie, $23.50@$24; Glengarnock, $22.50; and Eglinton, $21.

Rails.—All the near-by mills are supplied with orders until the early or late fall. Nominal quotations are $38 at mill. England cables £4 15s.

Old Rails.—There have been some small sales on the basis of $22@$22.50.

Scrap.—There has been a little business in off lots ex ship. We quote $23.50@$24. Crop-ends are $24.

Philadelphia. June 21.

The following is an official report of the meeting of iron-masters held at the office of the American Iron and Steel Association this afternoon, in accordance with a call issued by the Executive Committee of Eastern Iron Manufacturers, appointed at Coney Island on August 24th, 1882, consisting of Messrs. Oliver Williams, Chairman; William E. S. Baker, Secretary; and A. H. Peacock, J. Avery Richards, and Jesse L. Cooley. The object of the meeting was to form a new schedule of prices for extra sizes of bars, rods, bands, hoops, ovals, plates, and sheets, so as to cover the changes made necessary by the new tariff. The principal mills in the East were represented by the gentlemen in attendance. An organization was effected by the election of Oliver Williams as president and William E. S. Baker as secretary. It was resolved not to change the rates on oval, half-oval, half-round, round, and square iron and on flat iron down to 4⅛ inches to 6 by 2⅛ inches to 3. The prices of larger flats were left to the discretion of the mills. The rates on band and hoop iron were referred for adjustment to Messrs. Nevegold, Cooley, and Williams, who are to report at a subsequent meeting. It was resolved to revive the Eastern Iron-Masters' Association, for the purpose of discussing trade questions. The Executive Committee was continued, and was authorized to call another meeting whenever it should be deemed advisable to have one. It will probably be called during the summer, to meet at the seaside.

Pig-Iron.—No. 1 Foundry has met with an improving demand and better prices. Several sales of 50 to 100-ton lots have been closed within twenty-four hours, and there is a much more active inquiry, owing to the fact that supplies are not as heavy in makers' hands as was supposed, and consumers have been adhering too closely to the "hand-to-mouth" policy. Some of the standard makers have orders in hand for more than they care to take just at this juncture, though this fact does not mean that consumers will find any difficulty in obtaining sufficient iron to answer all requirements. In other words, prices will remain steadier, at least for this number, while No. 2 is still weak and correspondingly lower. Sales of No. 1 have been made at $22 in some cases, and several brands at $21. Very little is offered below this. No. 2 iron is selling all the way from $19@$20. There is a better feeling among foundry-men, but it will remain a difficult matter to dispose of unusually large lots during the heat of summer. The blowing-out of additional furnaces is still talked of, and a few more will most likely go, but the supply will be equal to all probable needs of the trade. In Gray Forge iron, prices range from as low as $17 at furnace, to $19 for some special brands, which appear to be pretty well sold up. The inquiry for Forge is good, but buyers have shown an unwillingness to pay $18 for what they want, and makers think prices have gone as low as they ought to go. Transactions for 1000-ton lots are in hand. Some of the offers referred to, at $17, have been taken. The supply is still large, and there is no appearance of any upward tendency, principally on account of the fact that mills will want about one third less iron during the summer, and by the opening of fall, the trade will have got on to its feet once more.

Foreign Irons.—But little definite information can be obtained from the consumers of foreign iron as to the probable demands for the future. Sellers have nothing to say. Bessemer pig might be bought at $21. Domestic supply is still large, and there is less dependence on foreign sources. Scotch iron is selling without attracting special notice.

Merchant Irons.—Another declining tendency has manifested itself. Yesterday, country mills sold fair iron at 2·10c., delivered, and were anxious for all the business to be had at that figure. Some few mills get 2·20c., but that figure is high, although the few mills selling at that price are not short of orders. Other mills are anxious for business at 2·15c. The country mills look for a revival of Western competition, and are quoting low to protect themselves against it. Several inquiries for 50 to 100-ton lots were floating around this week, and were, no doubt, provided for at 2·10c.@2·15c. Skelp iron is moderately active.

Nails.—Large deliveries of nails were made this week, and prices range from $3@$3.20, according to

NEW YORK MINING STOCKS.

DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE.												SALES.
	June 16.		June 18.		June 19.		June 20.		June 21.		June 22.		
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Alice, Mon.	2.75						2.75		2.50				250
Amie Con., Co.					.18		.17	.16	.17	.16	.18		3,400
Argenta, Ne.													
Bar. & Walker, Ut.													
Bassick, Co.													
Belle Isle, Ne.			.40								.71	.61	1,400
Bodie Cons., Ca.	1.00				1.00								750
Breece, Co.													
Bulwer, Ca.											.85	.80	200
California, Ne.					.35						.27		800
Cal. & Hecla, Mich.													
Carbonate Hill													
Caribou Con., Co.							.13		.13		.13		1,360
Chrysolite, Co.					1.20		1.20						500
Cons. Va., Ne.	.62		.62		.63		.59						1,000
Crown Point													
Deadwood-Terra, Dk.													
Dunkin, Co.	.20												200
Eureka Cons., Ne.	3.00		3.00		4.00					4.00			180
Excelsior, Ca.													
Father de Smet, Dk.													
Findley, Ga.									.10				500
Gold Stripe, Ca.													
Gould & Curry, Ne.					2.65								100
Grand Prize, Ne.													
Great Eastern, Dk.													
Green Mountain, Ca.							.75				.72		600
Hale & Norcross, Ne.													
Hall-Anderson, N. S													
Hibernia, Co.							.05						300
Homestake, Dk.			15.50				15.50						350
Horn-Silver, Ut.			6.75		6.50		6.50						455
Hukill, Co.	.07												500
Independence, Ne.			.60		.60								900
Iron Silver, Co.	2.90		3.00		2.90						3.00		1,830
La Plata, Co.													
Leadville C., Co.											.50		400
Little Chief, Co.	.55		.55		.62	.59	.65	.60	.65	.61	.63		10,600
Little Pittsburg, Co.					.99		.99		1.00		1.10	1.00	1,100
Martin White, Ne.													
Moose, Co.													
Navajo, Ne.			2.25		2.10		2.15				2 25		1,100
Northern Belle, Ne.			6.75								7.00		150
North Belle Isle, Ne.									.20				400
Ontario, Ut.									25.75	25.00	25 50		358
Ophir, Ne.													
Plumas, Ca.													
Prussian, Colo.													
Quicksilver Pref., Ca.													
" Com., Ca.													
Rising Sun, Ca.													
Robinson Cons., Co.	.75	.70	.71	.70	.70	.66	.64	.63	.61	.53	.58	.51	28,350
Savage, Ne.							2.50						100
Sierra Grande, N. M.	1.25	1.15	1.20	1.15	1.20	1.15	1.25	1.20	1.15	1.10	1.20	1.05	5,400
Sierra Nevada, Ne.			5.88		5.75	5.63	5.50				4.65		650
Silver King, Ar.													
Spring Valley, Ca.													
Standard, Ca.					6.63		6.50		6 75				320
Stormont, Ut.			.40										100
Tip Top, Ar.													
Tombstone, Ar.													
Vizina, Ar.													
Yellow Jacket					4.00								100

NON-DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE.												SALES.
	June 16.		June 18.		June 19.		June 20.		June 21.		June 22.		
	H	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Advance.													
Albion.													
Alta.													
Alta-Montana, G.	.03		.03						.03			.03	1,900
Am. Flag, S.													
Barcelona, G.													
Bear Creek													
Bechtel Con., G.													
Belvidere													
Best & Belcher, G. S.							4.25						5
Big Pittsburg, S. L.													
Bondholder													
Bradshaw, S.													
Buckeye													
" pref.													
Bull-Domingo, S.L.													
Bye and Bye													
Calaveras, G													
Clav'r's W.&M.Co.													
Cal., B. H., G.	1.00												100
Central Ariz'na, S.	.30								.30				300
Cherokee, G.													
Climax, Co.											.07	.05	.09	.07	3,200
Cons. Imp'ri'l, G.S.	.08														300
Crowell, G.															
Dahlonega, G.							.03								100
Decatur	.04						.04				.05	.04	.05		11,800
Dunderberg															
Durango, G.			.07	.06				.07							2,200
Eastern Oregon	.38	.36	.40	.39	.42	.40	.45	.40	.46	.45	.48	.46	13,000
Elko Cons.												.20	15,400
Enterprise													
Fannie Barret													
Globe Copper													
Gold Placer, G													
Goodshaw, G.													
Granville, G.													
Hariem M.& M.Co.	1.40								1.40						600
Hortense, S													
Lacrosse, G											.12	.11			1,500
Lucerne,															
Mariposa Pref., G															
" Com., G															
Mexican, G. S.									3.75						300
Miner Boy															
Momo															
North Standard, G.															
N. Horn-Silv'r, S L.															
Ori'nt'l & Miller, S.	.19						.16				.15				500
Quartz Creek.															
Rappahannock, G.	.10	.09	.08												3,400
Red Elephant, S.															
Ruby, of Arizona.															
Silver Cliff, S.															
Sonora Con.	.26	.23	.25	.22	.21	.21	.24	.23	.22		.24	.22	24,800
South Bodie, G.															
South Bulwer, G.															
South Hite			.10												100
South Pacific															
State Line, 1 & 4, S.															
" Nos. 2 & 3, S.															
Sutro Tunnel	.24	.23	.24	.22	.23	.22	.23	.22	.22		.21		24,800
Taylor-Plumas															
Unadilla, S.															
Union Cons, G.												5 50			100

Full tables giving the total amount of dividends, capital, etc., will be printed the first week of each month. Dividend shares sold, 64,643. Non-dividend shares sold, 104,405.

BOSTON MINING STOCKS.

	June 15.		June 16.		June 18.		June 19.		June 20.		June 21.		Sales
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Allouez													
Amie													
Atlantic													
Aztec													100
Bodie Con.									1.00				300
Bonanza D.			2.63						2.50				
Bowman Sil	.24	.23	.25	.24			.30	.26	.36	.30	.42	.35	19,700
Bruns. Ant.													
Bulwer													
California													
Cal. & Hec.			243				245		241				14
Catalpa	.70	.65	.65				.60		.60		.60		5,200
Central Ariz													
Cherryfield													
Co. Virginia							.62						200
Copper F'lls													
Copperop													
Crescent	.27½						.25						500
"Cusi"													
Decatur													
Deer Isle	.05												500
Denver City													
Douglas	.95												200
Duncan													
Dunkin											.24		100
Empire	.22										.20		800
Eureka Con.													
Franklin	10.38		10.38				10.25		10.00				475
Hancock G.									.50				200
Harshaw													
Huron													
Independ'ce													
Indian Q'n.													
Mammoth	.06		.05								.05		2,500
Mass. & N.M.	.07		.07				.07	.06	.07				5,300
Milton													
Napa													
National													
North. Belle													
Ontario													120
Osceola	19.00		19.50				19.50						
Penn-Breck													50
Pewabic	4.00												100
Pine Tree			.13										200
Plymouth									.16				189
Quincy	49.75		49.50				49.50				49.00		
Ridge													
Robinson													100
San Pedro									.40				100
S'ra Nevada									5.88		5.63		
S'ra Grande													100
Silver Islet			4.00										
Silver King													
Simpson Gd													
So. Pacific													
Standard													
Sullivan	2.00	1.75	1.78				2.00	1.75	1.88	1.75	1.88	1.75	2,783
Sutro Tun.	.25		.24				.24	.23	.23		.23		2,000
Sycamore	.23												100
Twin Lead.	.16	.13	.15						.12	.11	.13	.11	10,800
Vizina													

PHILADELPHIA MINING STOCKS.

	June 15.		June 16.		June 18.		June 19.		June 20.		June 21.		Sales.
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L	
Amer. Cons.													
Argent													
Arizona So.													
Battle Mt.													
Buena													
California													
Calista													
Chrysolite													
Cincinnati	.10												1,000
Comprom'e	.23		.22	.21									1,200
Contention													
Con. Virg.													
Dauntless													
Del Monte													
Denver City	19												34
Eureka													
Girard	.05												100
Governor													
Grand Uni'n	.20	.15											4,500
Green Mt													
Gunnison	.42½	.40	.40										1,900
Homestake													
Horn Silver													
Iowa Gulch	.08		.09	.08									3,300
Iron Silver													
King Bul'on													
Ledger Con.													
Little Dia'd													
Little Mam'd			.04										1,000
Little Pitts.													
L'g & D'y H													
Montana													
Mt. Sheridan													
Navajo													
North'n B'l.													
Orion													
Orion Pref.													
Palmetto E.													
Pembina			.14										1,000
Penn-Breck			.10										2,000
Permanent													
Pizarro													
Pizarro Ex.													
Potosi													
Rara Avis													1,600
Rara Avis E.	.09		.09										
Record													
Rico Pion'r.													6,600
Sierra Apac.	.27½	.25	.25										21,700
Sierra Be.la.	.52½	.50	.52½	.50									9,000
Sierra G'nde	1.30	1 17½	1.15	1.12½									
Sierra Nev.													
Silver Cord													
Silver King			.02										5,000
Silv'r Plume													
Sonora Con.													
Standard													1,000
Sultana			.04										
Sutro Tun'l.													50
Tombstone			.80										
Victor													
Yale Mt.													

size of orders. Mills are doing an excellent business, and building requirements are heavy. Some speculative inquiries have been heard of, but the chances are too much against purchase of nails at this time. Interior nails are selling at $3.10.

Structural Iron.—Orders footing up 7000 or 8000 tons have been placed this week, mostly for bridge iron, and the inquiries in hand to-day show that there are a good many requirements coming forward that will prevent any further cutting of rates for the present. Angles are quoted nominally at 2·40c. Other shapes are unchanged.

Plate and Tank Iron.—A good week's business was done in a retail way, and some inquiry for large lots under consideration, the only difficulty being the unwillingness of buyers to pay current prices. There is not much danger of a downward tendency, as the requirements, as a rule, are large, and mills are able to keep going.

Sheet-Iron is in better demand for the fall trade.

Steel Rails are in active demand for late summer delivery at $39 in small lots, and negotiations have closed for two or three round lots for fall delivery at about $38, with offers for winter delivery at less. The week's business has been up to the average, and if concessions were made, some heavy orders could be reported.

Old material is unchanged at $22.50 asked, and $21.50 offered. No. 1 Scrap, $24 offered, and occasional sales.

Cleveland. June 19.

A fair volume of business is doing in pig-iron, though there is not entire confidence on the part of consumers in present prices. However, with stocks steadily decreasing, we think that furnace-men are justified in believing that the bottom has been reached, and that any change in the situation must be an improvement. Much, of course, of the future of the trade depends on our crops. Although the wheat crop is undoubtedly going to be short, indications at present are for a good corn crop, which will help us out. There are no large or speculative lots buying that we learn of, purchasing seeming to be for actual short wants. We quote :

No. 1 Bessemer	$22.00@$23.00
" 1 Foundry, all ore	21.00@ 22.00
" 1 Foundry, cinder mixture	20.00@ 21.00
" 1 Soft Foundry	20.00@ 21.50
1 Open Silvery	19.50@ 20.00
Illirons	18.00@ 19.00
4 months f. o. b. cars furnaces.	
Nos. 1 and 2 Charcoal	$24.00@$26.00
" 3, 4, 5, and 6 Charcoal	25.00@ 26.50
Hanging Rock Charcoal	23.00@ 25.00
Strictly Cold-Blast Charcoal	25.50@ 30.00
4 months f. o. b. cars Cleveland.	
Bessemer ores	$7.00@ $8.00
Hematite ores	5.00@ 6.00

Pittsburg. June 20.

The iron trade in this city is in an exceedingly unsettled condition. Very few important transactions are coming to light. Buyers are waiting for unexpected happenings. In crude iron, the Marshall iron is still the source of uncertainty. Should it be precipitated upon the market, prices would suddenly decline. The uncertainty as to the course likely to be pursued with this large stock of iron prevents the trade from returning to its legitimate limits, and is used as an argument to break down prices from what they ought to be. The local furnaces continue to supply requirements, and hence keep out distant iron on account of commissions and freight incident to shipping. Anthracite Forge iron sells at $18 ; Lake ore Bessemer iron, $21.50 ; Coke iron, $17.50@$18 ; Charcoal iron, $26@$27. Offers have been made from 50 cents to in some cases $1 below these figures, but wants will not be provided for except for immediate requirements. Muck Bars are weak at $34@$34.50. Inquiry for merchant bar has fallen off because of the heavy production and the accumulation of stocks. Mills will shut down for from four to six weeks in some cases, and on the whole, there will be a heavy restriction of output. Prices are still at 2 cents, but there are fears of a break, which, if it starts, will be followed by all. Nails continue in quite active demand at $3 for car-load lots. Large shipments are made, and the demand is fully up to the supply. Gas and steam-pipe is selling at 70 and 10 off ; boiler tubes, 55 and 5 off. Consumers are ordering with more freedom, and the trade outlook is good. Bessemer mills are well supplied with orders for from three to four months to come, but are able to take orders for summer delivery in a small way at $38.50. Fall and winter orders can be had at 50 cents to $1 less. Spikes are 2·60c. ; Splice Bars, 2c. ; Track Bolts, 3·25c. Old Rails are quoted at $22.50@$23 for immediate delivery, and offers are made at $22.25. But few transactions can be reported. The steel trade is in an unsatisfactory shape. Low-grade steels are cut, and mills are not working full time. Crop-ends are quoted nominally at $25. Selected Railroad Scrap, $24 ; Ordinary, $23.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, June 22.

Anthracite.

The anthracite coal trade continues dull. The announcement of an advance, semi-officially made, has fallen flat, and the happenings of the past week have fully confirmed the views as to the wisdom of the course adopted expressed in our last issue. The condition of the trade does not warrant any increase in the price, except in the best Lehigh coals, which are now and have for some time been selling for from 5 to 10 cents above the June circular prices. The position of the majority of the companies doing a large business in this city is not such that they can afford to check what buying there is by insisting upon higher prices. It is entirely out of the question, so far as those sizes used chiefly for manufacturing purposes are concerned, and we understand that, in view of this fact, the attempt to put up broken coal 10 cents, as first reported, has been abandoned. We can not help expressing the opinion that it would be wise to do the same for the other sizes.

Coal says editorially this week : The report that the Lehigh Valley Railroad has been leased by the Pennsylvania Railroad has been promptly denied by both the parties, and yet few in the coal trade doubt that some agreement, though perhaps not precisely in the nature of a lease, has been arrived at. The well-known antagonism between the management of the Pennsylvania and Lehigh railroad companies on the one hand, and the Philadelphia & Reading, New York Central, and Baltimore & Ohio companies on the other, gives color to the statement that a closer alliance between the two former companies has been effected, as an offset against the fusion between the Reading and Jersey Central companies. Both the Pennsylvania and Lehigh companies are financially very strong, and the latter has a very favorable traffic arrangement with the Erie, securing to it a well-nursed Western business. The Pennsylvania, with the support of the Lehigh Valley Company, is capable of wielding a tremendous power in the coal trade, and is in a position to inflict much injury when it sees fit to break prices in retaliation for real or imaginary wrongs. What the policy of the new allies will be, it is, of course, impossible to say. They have, of course, a very great interest in making the coal business a profitable one to themselves; but they may become possessed of the idea of hurting others seriously, even though they may injure themselves a little. The past history of railroad wars has shown, over and over again, that reason is little listened to in the heat of the battle.

Such are the comments we hear on every side in the coal trade. There is a feeling of uncertainty and uneasiness, which early events may set at rest. The strategic movements of the first half of the year may lead to a long period of peace, and the coal trade move along serenely, grappling with an increased output. There may be only a shuffle for position in the Western markets ; but the manner in which the great powers are manoeuvering for position is not exactly calculated to make the trade feel comfortable.

Mr. John H. Jones, official accountant, has just published the following statement of the anthracite coal tonnage for May, 1883. The statement includes the entire production of anthracite coal, excepting that consumed by employés, and for steam and heating purposes about the mines :

	May, 1883.	For year 1883.	For year 1882.	Difference.
Phila. & Reading RR.	563,069	2,618,729	2,320,207	I. 298,522
Lehigh Valley RR.	*483,258	2,318,891	2,058,827	I. 259,974
Central RR. of N. J.	380,729	1,745,399	1,483,526	I. 261,872
Del., Lack. & W. RR.	391,239	1,802,036	1,591,201	I. 210,836
Del. & Hud. Canal Co	†266,264	1,243,814	1,094,770	I. 149,043
Penna. RR.	219,609	955,297	836,584	I. 118,713
Penna. Coal Co.	109,779	528,667	472,049	I. 56,618
N. Y., L. E. & W. RR	25,277	127,443	85,648	I. 41,795
Total	2,439,224	11,340,185	9,942,812	I. 1,397,373

* This amount includes the production of the mines of the State Line and Sullivan Railroad Company, amounting to 5789 tons.

† In addition, there were 37,949 tons transported from mines by the Delaware & Hudson Canal Company during May, which is included in tonnage of other interests.

The stock of coal on hand at tide-water shipping points, May 31st, 1883, was 645,377 tons ; on April 30th, 1883, 719,232 tons ; decrease, 73,855 tons.

Bituminous.

The trade during the week has been very dull. Current business is small and the competition for it very active, so that all sorts of prices are spoken of. We understand that coal shipped via Buffalo and the Erie Canal, by the Rochester & Pittsburg Railroad, was sold as low as $3.75, and that some Clearfield shippers are cutting under $4. We quote Clearfield $4@4.25, and Cumberland $4.15@$4.40, according to quality. The Chesapeake & Ohio Canal has reduced tolls to 90 cents to Georgetown and 95 cents to Alexandria.

STATISTICS OF COAL PRODUCTION.

Comparative statement of the production of anthracite coal for the week ended June 16th and year from January 1st :

TONS OF 2240 LBS.	1883. Week.	1883. Year.	1882. Week.	1882. Year.
Wyoming Region.				
D. & H. Canal Co.	99,026	1,603,119	81,556	1,372,920
D. L. & W. RR. Co.	107,637	2,017,069	112,507	1,799,620
Penna. Coal Co.	35,230	563,133	37,757	505,309
L. V. RR. Co.	25,193	465,543	37,843	470,169
P. & N. Y. RR. Co.	5,735	89,402	5,690	86,783
C. RR. of N. J.	58,602	1,091,737	59,656	982,286
Penna. Canal Co.	14,779	136,526	16,709	143,921
North & West Br. RR.		202,304		
	346,199	6,168,833	351,718	5,361,008
Lehigh Region.				
L. V. RR. Co.	129,117	2,100,789	120,834	1,936,052
C. RR. of N. J.	53,737	997,154	59,463	884,036
S. H. & W. B. RR.		20,235		18,000
	182,854	3,118,178	180,297	2,838,088
Schuylkill Region.				
P. & R. RR. Co.	196,250	2,956,319	148,095	2,588,237
Shamokin & Lykens Val.	31,806	589,669		463,444
	228,056	3,545,988	148,095	3,051,681
Sullivan Region.				
State Line & Sul. RR. Co.	1,239	27,440	1,229	23,864
Total	758,348	12,860,439	681,339	11,274,641
Increase		1,585,798		
Decrease				

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

Total same time in	1878	6,699,864 tons.
" " "	1879	10,982,190 "
" " "	1880	9,507,469 "
" " "	1881	11,446,667 "

The increase in shipments of Cumberland Coal over the Cumberland Branch and Cumberland & Pennsylvania railroads amounts to 299,573 tons, as compared with the corresponding period in 1882.

Belvidere-Delaware Railroad Report for the week ended June 16th :

	Week.	Year. 1883.	Year. 1882.
Coal for shipment at Coal Port (Trenton)	4,380	38,243	26,192
Coal for shipment at South Amboy	16,790	369,715	352,042
Coal for distribution	16,566	357,022	318,812
Coal for company's use	3,026	67,532	59,023
Total	40,762	822,512	756,069
Increase		66,441	
Decrease			

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DIVIDENDS.

OFFICE OF THE HOMESTAKE MINING COMPANY, Mills Building, 15 Broad Street,
NEW YORK, June 12, 1883.

DIVIDEND NO. 58.

The regular monthly dividend of FORTY CENTS per share has been declared for May, payable at the office of the Transfer-Agents, Lounsbery & Haggin, Mills Building, 15 Broad Street, on the 25th inst.

Transfer-books close on the 20th inst.

LOUNSBERY & HAGGIN, Transfer-Agents.